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A SEMIMONTHLY ABSTRACT JOURNAL WITH INDEXES

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AUGUST 8, 1970

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INTRODUCTION

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Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics. 2698

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Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation. 2731

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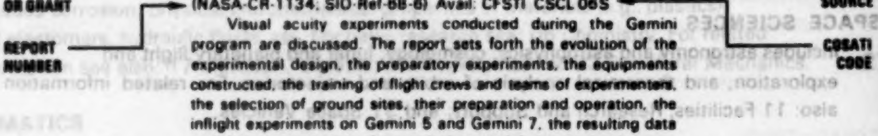

N70-10813*# California Univ., San Diego.
EXPERIMENTS ON VISUAL ACUITY AND THE VISIBILITY OF MARKINGS ON THE GROUND IN LONG-DURATION EARTH-ORBITAL SPACE FLIGHT
S. Q. Duntley, R. W. Austin, J. L. Harris, and J. H. Taylor
Washington NASA Nov. 1968 231 p refs
(Contract NAS9-5095)
(NASA-CR-1134; SIO-Ref-68-6) Avail: CFSTI CSCL 06S

Visual acuity experiments conducted during the Gemini program are discussed. The report sets forth the evolution of the experimental design, the preparatory experiments, the equipments constructed, the training of flight crews and teams of experimenters, the selection of ground sites, their preparation and operation, the inflight experiments on Gemini 5 and Gemini 7, the resulting data and their interpretation, the conclusions and their meaning in terms of the Apollo mission and other future spaceflights, as well as certain suggestions for future inflight tests of human visual capabilities in space. Author

VOLUME 8 NUMBER 15 / AUGUST 8, 1970

Scientific and Technical Aerospace Reports

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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbo machinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N70-29263* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AERODYNAMIC CONSIDERATIONS
T. G. Reed and E. L. Linsley *In* AGARD Wind Effects on Launch Vehicles Feb. 1970 p 75-114 refs (See N70-29260 15-31)
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Steady and unsteady flow phenomena are described. A discussion is presented of ground wind problems which are a sore point insofar as the subject matter is not sufficiently understood today to permit practical and safe engineering solutions for large launch vehicles. The shortcomings in present knowledge and the practical actions taken so far are identified. Nonstationary flow phenomena in flight is treated briefly. Practical viewpoints and approaches to various areas of aerodynamics, even though some are only indirectly related to wind problems, are given. Author

N70-29266# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
WIND-VEHICLE INTERACTION IN FLIGHT: METHODS OF ANALYSIS
M. H. Rheinfurth *In* AGARD Wind Effects on Launch Vehicles Feb. 1970 p 199-226 refs (See N70-29260 15-31)
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The equations needed for a system analysis both for the deterministic and for the statistical approach are developed. While the statistical approach is fundamentally the natural one for our problem, there are still shortcomings in the theoretical tools which have severely limited their practical applications, more so for vehicles than for aircraft. Author

N70-29359 Houston Univ., Tex.
SINUSOIDAL FLOW AROUND A CIRCULAR CYLINDER
Emmett Garrison Ward (Ph.D. Thesis) 1968 105 p
Avail: Univ. Microfilms: HC $5.20/Microfilm $3.00 Order No. 69-790

The flow around a stationary cylinder, which is subjected to a sinusoidally varying freestream velocity, was studied analytically. The flow considered was characterized by symmetric vortex pairs which were forcibly shed from the cylinder due to the oscillating nature of the flow. The problem was formulated in terms of inviscid potential flow theory. The physical vortices and the separated boundary layers feeding the vortices were replaced with vortex filaments and vortex sheets using the lumped vortex model. The resulting formulation provided equations which could be solved for the instantaneous locations and strengths of the vortices. A mathematical condition for the forced shedding of the vortices was postulated and after this shedding had occurred, the vortices were treated as free vortices. Dissert. Abstr.

N70-29384# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
THE VARIOUS OPERATING REGIMES OF SUPERSONIC COMPRESSORS [LES DIVERS REGIMES DE FONCTIONNEMENT DES COMPRESSEURS SUPERSONIQUES]
Jean Fabri 1969 51 p refs In FRENCH; ENGLISH summary Presented at ONERA Specialists Meeting, Paris, 18 Nov. 1968
(ONERA-NT-145) Avail: CFSTI

The limitation of the flow-rate, an essential aspect of the design of high specific flow-rate supersonic compressors, is due to various aerodynamic configurations according to the Mach number reached. The hybrid regime, corresponding to the sonic choking in the gaps between the blades appears at transonic rotating speeds; in the supersonic regime induced at higher speeds, the geometry of the blade upper surface plays the essential role in the determination of the flow-rate; at very high rotating velocities the sonic choking in the inlet duct limits the flow-rate. These operating regimes were observed in the experimental results obtained. Author

N70-29403# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
PRESENT STATUS OF UNSTEADY AERODYNAMICS FOR LIFTING SURFACE
H. Bergh and R. J. Zwaan *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 17 p refs (See N70-29401 15-02)
Avail: CFSTI

A survey is given of existing theoretical and experimental routine methods for determining pressure distributions on generalised forces on oscillating lifting surfaces. Some comparisons between results of theory and experiment are shown. Techniques are indicated to apply measured data in development work. Tunnel wall influence on measurements is discussed. Author

N70-29404# Sud-Aviation, Paris (France).
PROBLEMS POSED BY THE DETERMINATION OF AERODYNAMIC FORCES ACTING ON AIRCRAFT FLEXIBILITY [PROBLEMS POSES PAR LA DETERMINATION DE FORCES AERODYNAMIQUES AGISSANT SUR L'AVION SOUPLE]
L. Darovsky *In* AGARD Aeroelastic Effects from A Flight Mech. Standpoint Mar. 1970 17 p In FRENCH (See N70-29401 15-02)
Avail: CFSTI

The need for close collaboration in the aerodynamics and aeroelasticity disciplines is stressed, with particular reference to developing different mathematical formulas to calculate the performance of flexible aircraft. Several equations are derived to describe aircraft response to a variety of aerodynamic forces and flight conditions. Transl. by M.G.J.

N70-29408# Boeing Co., Philadelphia, Pa. Vertol Div.

AEROELASTIC PROBLEMS OF FLEXIBLE V/STOL ROTORS

D. E. Brandt *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 19 p refs (See N70-29401 15-02)
Avail: CFSTI

Aeroelastic problems associated with the use of large rotors in V/STOL aircraft are presented. These include divergence and whirl flutter of large rotors when operating in the propulsive mode, mechanical instability in the hover to ground mode, and gust response characteristics peculiar to large propulsive rotors. The mechanism of these instabilities and response phenomena are described and methods for their control using feedback concepts are examined. Some results of studies for a typical configuration are given. The value of dynamically similar models for large rotors is emphasized and some results are presented for programs involving such models. Author

N70-29411# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.

THE INFLUENCE OF COMPRESSIBILITY ON THE AIRLOADS ON OSCILLATING ROTOR BLADES IN HOVERING FLIGHT

W. P. Jones and B. M. Rao *In* AGARD Aeroelastic Effects from A flight Mech. Standpoint Mar. 1970 9 p refs (See N70-29401 15-02)
Avail: CFSTI

A method is presented for determining compressibility effects on oscillating rotor blades. The theory makes use of a two-dimensional mathematical model of the flow in which a typical section of the reference blade is replaced by an airfoil with a straight wake and a system of regularly spaced infinite wakes below it, including those from other blades. This model yields the result that the downwash due to the infinite system of wakes is independent of Mach number when the blade circulation is assigned. Aerodynamic coefficients obtained from previous work together with some additional results are given and their significance discussed from the point of view of blade instability. At the higher Mach numbers the coefficients vary considerably in value but the variation with phase difference between the wakes shows a similar trend to that for incompressible flow. The aerodynamic damping coefficients for plunging (flapping) oscillations and for pitching oscillations about the quarter-chord axis are always positive but can be small when the blade oscillates at an exact number of cycles per revolution. For pitching axis positions, forward of quarter-chord, it is shown that blade instability is possible for a wide range of axis positions and frequency parameter values. Author

N70-29416# Technische Hochschule Carolo Wilhelmina, Brunswick (West Germany). Lehrstuhl fuer Angewandte Mechanik.

COMBINED EFFECTS OF AEROELASTIC COUPLING AND AERODYNAMIC INTERFERENCE BETWEEN TWO LIFTING SURFACES (WING-TAIL, TANDEM WINGS) ON THE LONGITUDINAL STABILITY

P. G. Hamel *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 22 p refs (See N70-29401 15-02)
Avail: CFSTI

An analytical procedure is presented determining unsteady aerodynamic effects on the longitudinal stability of flexible flight vehicles with tandem lifting surfaces. Circulation lag effects associated with rapid changes of lift and downwash time-delay effects, due to the front wing wake that does not affect the rear wing lift instantaneously, are considered. The root locus technique is applied to demonstrate how strongly the downwash time-delay destabilizes the first bending mode of the fuselage for certain tandem configurations. The time vector concept is being used for physical interpretation. The classical root locus method is extended to find exact critical values for downwash time-delays and to determine the behavior of the root locus in the vicinity of a critical point. Some general results and root sensitivity investigations are given to show how structural and aerodynamic parameters and their variations influence the stability roots of the aeroelastic coupled system. Author

N70-29417# Dornier-Werke G.m.b.H., Munich (West Germany).

THEORETICAL INVESTIGATION OF AEROELASTIC INFLUENCES ON THE LIFT DISTRIBUTION AND THE AERODYNAMIC DERIVATIVES OF SWEPT WINGS AT SYMMETRIC AND ANTISYMMETRIC STATIONARY FLIGHT CONDITIONS

W. Schoernack and E. Haessler *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 25 p (See N70-29401 15-02)
Avail: CFSTI

An analytic solution is given for the calculation of aeroelastic effects on the elastic wing-system. The physical problem is described by matrix equations, using generalised coordinates. Whilst the elastic effects are handled by a development according to Ritz, the aerodynamic forces are introduced into the calculation by using Weissinger's lifting line theory. The analysis results in the determination of the following effects: deformations, changes of the angle of attack, positions of the centre pressure, and distribution of the aerodynamic forces over the wing-span, allowing values and corrections of the total derivatives to be calculated. Using as an example the A-300 Airbus, a big passenger aircraft just being developed, some applications of the aforementioned method are discussed. Calculation of the aeroelastic displacement of the wing aerodynamic centre, determination of aeroelastic reductions of the wing lift gradient, and investigations pertaining to loss or reversal of control surface effectiveness - all aeroelastic influences being considered as a function of airspeed, Mach number, and altitude are considered. Author

N70-29517# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

WAVENUMBER-FREQUENCY SPECTRA OF TURBULENT BOUNDARY LAYER PRESSURE MEASURED BY MICROPHONE ARRAYS

William K. Blake and David M. Chase 25 Apr. 1969 79 p refs
(Contract Nonr-3468(00))
(AD-701353; BBN-1769) Avail: CFSTI CSCL 20/4

Measurements of frequency spectra of pressure along a wind-tunnel wall were made by single microphones and by a longitudinal array of four flush 0.8-inch circular microphones connected with alternating and with common phase. The alternating-phase array was designed to suppress by its wavenumber filtering the background acoustic duct noise at frequencies near 3 kHz. The measured levels set upper limits on low-wavenumber boundary-layer pressure. Analysis indicates that the high-wavenumber (convective) contribution in this frequency range was probably negligible, but it could not be definitely established whether background noise dominated the spectra or whether the upper bound set on low-wavenumber boundary-layer noise is a close one. On assumption of wavenumber independence in most of the pertinent low-wavenumber domain, an upper bound is given for the wavenumber spectral density of boundary-layer pressure, and its generalization is discussed. At lower frequencies, in identifiable domains where single-microphone and array spectra are dominated by the convective wavenumber component of boundary-layer pressure, satisfactory agreement is found with theoretical predictions based on current knowledge of the spectral density in the convective-wavenumber domain and ona measured facial sensitivity distribution for the microphone. In general, salient features of the array spectra correlate well with expectation, and the array technique is demonstrated to be a useful one for the subject purposes. Author (TAB)

N70-29652# Texas Univ., Austin. Applied Mechanics Research Lab.

HYPERSONIC AIRFOILS OF MAXIMUM LIFT-TO-DRAG RATIO

Roger A. Thompson and David G. Hull Aug. 1969 34 p refs
(Grant AF-AFOSR-1744-69)
(AD-702106; VSAF-002; TR-1009) Avail: CFSTI CSCL 1/3

The problem of determining the slender, hypersonic airfoil shape which produces the maximum lift-to-drag ratio for a given profile area, chord, and free-stream conditions is considered. For the estimation of the lift and the drag, the pressure distribution on a surface which sees the flow is approximated by the tangent-wedge relation. On the other hand, for surfaces which do not see the flow, the Prandtl-Meyer relation is used. Finally, base drag is neglected, while the skin-friction coefficient is assumed to be a constant, average value. The method used to determine the optimum upper and lower surfaces is the calculus of variations. Depending on the value of the governing parameter, the optimum airfoil shapes are found to be of three types. For low values of the governing parameter, the optimum shape is a flat plate at an angle of attack followed by slightly concave upper and lower surfaces. The next type of solution has a finite thickness over the entire chord with the upper surface inclined so that the flow is an expansion. Finally, for the last type of solution, the upper surface begins with a portion which sees the flow and is followed by an inclined portion similar to that above. For all of these solutions, the lower surface sees the flow. Results are presented for the optimum non-dimensional airfoil shape, its dimensions, and the maximum lift-to-drag ratio. To calculate an actual airfoil shape requires an iteration procedure due to the assumption on the skin-friction coefficient. However, simple results can be obtained by assuming an approximate value for the skin-friction coefficient. Author (TAB)

N70-29754# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.

LAMINAR BOUNDARY LAYER ON A FLAT PLATE AT LOW PRANDTL NUMBER, PART 1

Roddam Narasimha and Noor Afzal Jan. 1969 28 p refs
(AE-171-A) Avail: CFSTI

Using the method of matched asymptotic expansions, the first four terms in the low Prandtl number expansion are obtained for the recovery temperature and heat transfer in the flat plate compressible boundary layer (assuming a viscosity proportional to temperature). It is found that the results so obtained are useful even at Prandtl numbers at least as high as 15, provided the series are properly Eulerized. Author

N70-29802*# Scientific Translation Service, Santa Barbara, Calif.

A CALCULATION METHOD FOR WINGS IN STEADY OR UNSTEADY SUPERSONIC FLOW [UNE METHODE DE CALCUL DES AILES EN ECOULEMENT SUPERSONIQUE STATIONNAIRE OU INSTATIONNAIRE]

J. M. Brun-Gabriel Washington NASA May 1970 26 p refs Transl. into ENGLISH from Rech. Aerospatiale (Paris), no. 132, Sep. - Oct. 1969 p 3 - 13
(Contract NASw-2035)
(NASA-TT-F-13033) Avail: CFSTI CSCL 20D

A wing calculation method is presented, which, based on the source supersonic method, seeks its precision through a refined representation of the leading and the trailing edge shape, and also through the systematic study of the singularities at the leading edge. A few examples of steady and unsteady flows are presented, and comparisons are made with previously used methods. After preliminary work done on the electric calculator, a program has been written for the Univac 1108 computer. This program permits a systematic exploitation due to the wide generality of the method and to the very short computing time involved. Author

N70-29822*# Techtran Corp., Glen Burnie, Md.

JET FLOW AROUND A SPHERE [O STRUYNOM OBTEKANII SHARA]

T. A. Vilgelmi Washington NASA May 1970 10 p refs Transl. into ENGLISH from Zh. Prik. Mekhan. i Tekhn. Fiz. (Moscow), no. 5, 1969 p 76 - 80
(Contract NASw-2037)
(NASA-TT-F-13015) Avail: CFSTI CSCL 20D

The reasons for the stable behavior of a sphere in a thin jet of gas or liquid directed vertically upward are examined on the basis of previous studies and the author's own experiments. By conceiving of the jet as diverging ahead of the sphere and converging behind it, the problem becomes one of determining the characteristics of boundary layer flow which keep the sphere within the jet. Author

N70-29880*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COOLANT PRESSURE AND FLOW DISTRIBUTION THROUGH AN AIR-COOLED VANE FOR A HIGH TEMPERATURE GAS TURBINE

John S. Clark, Hadley T. Richards, David J. Poferl, and John N. B. Livingood Washington Jun. 1970 44 p refs
(NASA-TM-X-2028; E-5558) Avail: CFSTI CSCL 20D

These distributions were obtained in the leading-edge, midchord, and trailing-edge regions of the vane. Pressure and flow distributions were measured over a range of inlet air flow rates from 0.022 to 0.088 pound per second (10 to 40 g/sec), inlet pressures from 28 to 73 psia, and temperatures from 80 to 1000 F. Experimental friction pressure drops in the leading edge exit passage and the midchord supply tube were larger than those calculated assuming turbulent flow in smooth tubes but could be correlated with average flow rates. The pressure drop in the trailing-edge suction and pressure side film-cooling slots were correlated with compressible discharge coefficients. The frictional pressure drops in the split trailing edge were correlated with trailing-edge flow rates. Experimental loss coefficients determined from the vane inlet supply tube to the midchord supply tube compared fairly well with predicted values. Pressure distributions were calculated using one-dimensional momentum analyses for those passages of the vanes involving flow ejection or injection through porous walls. Preliminary three-dimensional heat-transfer computations indicate that vane flowrate distributions predicted using the experimental correlations will result in a maximum error of + or - 40 F in calculated vane metal temperatures. Author

N70-29906*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

SOME TURBULENT BOUNDARY-LAYER MEASUREMENTS OBTAINED FROM THE FOREBODY OF AN AIRPLANE AT MACH NUMBERS UP TO 1.72

Edwin J. Saltzman and David F. Fisher Washington Jun. 1970 47 p refs
(NASA-TN-D-5838; H-567) CSCL 20D

Boundary-layer-profile data were obtained from the smooth undersurface of an airplane fuselage during the demonstration of sensors for measuring boundary-layer characteristics. The data represent Mach numbers from 0.51 to 1.72, angles of attack up to 7 deg, and Reynolds numbers up to 74 million. The data are interpreted in terms of local skin friction and momentum thickness, and the velocity profiles from which these data are derived are tabulated. Local transformed friction coefficients obtained from a Clauser type of determination from velocity profiles were close to the incompressible values of Karman-Schoenherr when presented as a function of momentum thickness Reynolds number. Turbulent momentum thickness values were significantly influenced by angle of attack. The flight values of momentum thickness for angles of attack near 6 deg to 7 deg were lower than flat-plate values, approaching the level for slender cones. At angles of attack near 0 deg to 1 deg momentum thickness from flight was higher than flat-plate values. The aircraft nose boom and the protuberances on the boom are believed to be major reasons for the additional thickness at low angles of attack. Author

N70-29934# Air Force Systems Command, Wright-Patterson AFB, Ohio. Flight Dynamics Lab.

AN INVESTIGATION OF NONUNIFORM HYPERSONIC FREE-STREAM FLOWS ABOUT BLUNT AXISYMMETRIC BODIES Technical Report, Dec. 1968 - Feb. 1969

Jerold L. Patterson and Arthur B. Lewis Nov. 1969 53 p refs
(AD-700984; AFFDL-TR-69-57) Avail: CFSTI CSCL 20/4

The effect of selected nonuniform free-stream density and velocity profiles on the hypersonic flow field about a spherically blunted cone was investigated using a computer program. The program uses an iterated inverse method on the subsonic-transonic region and a modification of the method of characteristics in the supersonic region. Nonuniformity of the principal free-stream variables is provided by means of a bivariate fit using the center-line values. Results are presented which demonstrate that the computer program will provide reasonable predictions of the effects of the specific nonuniform free streams investigated. In addition, results are presented which show that these nonuniform free streams can have a significant effect upon the resultant flow field, particularly upon shock shape and body surface pressure distribution in the supersonic region. Author (TAB)

N70-29950# London Univ. (England). Dept. of Aeronautics.

A METHOD FOR CALCULATING THE STABILITY AND CONTROL DERIVATIVES OF HELICOPTERS WITH HINGELESS ROTORS

A. R. S. Bramwell 1969 80 p refs Sponsored in part by Minn. of Technol.
(Aero-69/4) Avail: CFSTI

A method is given for the calculation of the control angles to trim and the stability and control derivatives of helicopters with hingeless rotors. The results are presented in the form of working formulas. The special cases of hovering and level forward flight give results which, apart from the moments due to elastic stiffness, resemble the formulas for the hinged rotor. The expressions for the stability and control moment derivatives are simple and indicate that they can be at least five times as large as those from a hinged rotor. The analysis is based upon representing the blade by its first bending mode shape and frequency rather than the more familiar representation as a rigid blade with offset hinge and hinge spring. The equivalence claimed for the latter system is shown to be ambiguous. A blade offset is defined, based upon the blade shape rather than the rotating and nonrotating frequencies. Author

N70-29988*# Alabama Univ. Research Inst., Huntsville.

INVISCID HYPERSONIC FLOW OF CHEMICALLY RELAXING AIR ABOUT POINTED CIRCULAR CONES

Juergen Thoenes (Ph.D. Thesis) May 1969 157 p refs
(Grant NGL-01-002-001)
(NASA-CR-110356; UARI-66) Avail: CFSTI CSCL 20D

Inviscid hypersonic flow of chemically relaxing air about pointed circular cones has been calculated using Dorodnitsyn's one-strip integral method. The air model used consists of O2, N2, O, N, and NO, of which the relative amounts are controlled by six reaction equations which actually represent eighteen chemical reactions. Also considered are the limiting cases of nonequilibrium flow, namely, chemically frozen flow, and the flow with chemical equilibrium. Vibrational equilibrium has been assumed throughout. The principal contribution of the study lies in the method of solution. Specifically, it is demonstrated that the replacement of the approximate tangential momentum equation, and of all approximate species continuity equations by their exact forms along the body surface leads to a system of equations which, first, can be stably integrated, and second, yields results which compare quite well with those obtained by the method of characteristics. A detailed discussion of the polynomial approximations employed in the integral method, the introduction of a characteristic relaxation length defined in terms of the initial species mass fraction gradients, as well as many new results for hyeersonic flow of air with finite rate nonequilibrium dissociation about circular cones are further contributions of the study. Author

N70-30015# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.

EXPERIMENTAL INVESTIGATION OF THE MEAN FLOW AND STABILITY OF THE LAMINAR SUPERSONIC CONE WAKE

Dennis K. Mc Laughlin Jan. 1970 170 p refs
(Contract F44620-69-C-0013)
(AD-702136; TR-164; AFOSR-70-0072TR) Avail: CFSTI CSCL 16/3

The mean flow and stability of the near wake of a cone at Mach number 4.3 were studied experimentally. Free stream Reynolds numbers varied from 40,600 to 94,300. The cone had a 7 degree half angle, a sharp nose, and a wall temperature very close to recovery temperature. Important differences between the measured supersonic wake and other investigators measurements in hypersonic cone wakes are found. Author (TAB)

N70-30041# National Aerospace Lab., Tokyo (Japan).

UNSTEADY SURFACE PRESSURE ON AN OSCILLATING AEROFOIL AT HIGH MEAN ANGLES OF ATTACK WITH SPECIAL REFERENCE TO STALL FLUTTER

Yasuharu Nakamura, Koji Isogai, and Hiroshi Ejiri 1969 27 p refs In JAPANESE; ENGLISH summary
(NAL-TR-181) Avail: CFSTI

Measurements of unsteady surface pressure acting on a two-dimensional airfoil oscillating in pitch about the midchord at high mean angles of attack were undertaken. Tests were made for mean angles of attack up to 18 deg over the range of the reduced frequency 0.1 to 1.0, and of Reynolds number from 35,000 to 57,000. The experimental wave forms of the surface pressure show characteristic variations with the changes in parameters; namely, the reduced frequency, the mean angle of attack, and the position of the pressure hole on the surfaces of the airfoil. For an airfoil oscillating at a mean angle of attack close to the static stalling angle, a large distortion of the leading edge suction is encountered as a result of bubble burst. The variations in the magnitude and the phase lag angle of this distortion with the reduced frequency show good correspondence with those of the thickness of the separated shear layer. It is also found that in contrast to static stall, the pressure in the dead air region is no longer constant for dynamic stall, but varies at the forcing frequency, with the magnitude and the phase angle depending on the chordwise position. Author

N70-30048*# Techtran Corp., Glen Burnie, Md.

NEW METHOD OF CALCULATING CORRECTIONS OF TEST RESULTS IN A LOW-SPEED WIND TUNNEL: BLOCKAGE CORRECTIONS AND WALL CORRECTIONS [NOUVELLE METHODE DE CALCUL DE CORRECTION DES RESULTATS D'ESSAIS EN SOUFFLERIE BASSE-VITESSE]

J. C. Vayssaire Washington NASA May 1970 33 p refs Transl. into ENGLISH from Aeronaut. Astronaut. (Paris), v. 15, no. 8, 1969 p 55-67
(Contract NASw-1695)
(NASA-TT-F-13057) Avail: CFSTI CSCL 20D

Demonstration of how empirical formulas, which serve to determine the scales of models in low-speed wind tunnels, are inadequate and lead to the use of small models in large test chambers. Two types of corrections are proposed (blockage corrections and wall corrections) to obtain uniform results from models, or half-models of large size in relation to the test chamber. A number of studies dealing with blockage corrections are analyzed. The essential concepts relating to wall corrections are reviewed and further developed. Currently used blockage correction formulas are presented, and some examples of wall corrections are proposed. The study is illustrated by some test results. Author

N70-30082# National Aerospace Lab., Tokyo (Japan).

AN IMPROVED METHOD OF DESIGNING AND CALCULATING THE MINIMAL WAVE DRAG CONFIGURATION BY SUPERSONIC AND MOMENT-OF-AREA RULES

Kenneth K. Yoshikawa Oct. 1969 95 p refs
(NAL-TR-184T) Avail: CFSTI

A method for calculating supersonic wave drag, especially for calculating the interference drag between multiple components is discussed. The method is particularly useful in designing the configuration that will provide the minimum total wave drag required at the specified flight condition. The concept of combining the moment-of-area rule and supersonic-area rule is employed along with the other harmonic analysis in an attempt to develop a more accurate and simple method. The coefficients of a Fourier sine series for the primary bodies of revolution at the conditions of different body length are tabulated, and thus the calculation of interference drags between multiple configurations becomes only an algebraic procedure. Author

N70-30093# Weapons Research Establishment, Adelaide (Australia).

THE SPACING, POSITION AND STRENGTH OF VORTICES IN THE WAKE OF SLENDER CYLINDRICAL BODIES AT LARGE INCIDENCE

K. D. Thompson and D. F. Morrison Jun. 1969 51 p refs
(WRE-HSA-25) Avail: CFSTI

Extensive schlieren studies and yawmeter traverses of the wake behind slender cone-cylinders at large angles of attack have shown that the flow pattern is generally steady. Under certain flow conditions, however, the wake exhibits an instability which is not yet understood. Provided the flow pattern is steady, the impulse flow analogy is applicable for cross-flow Reynolds number in the subcritical region and for cross-flow Mach numbers M sub c less than 1.0. The wake can be described in terms of a cross-flow Strouhal number which has a constant value of 0.2 up to M sub c = 0.7 and then increases steadily to a value of 0.6 at M sub c = 1.6. Schlieren photographs can be analyzed very simply using the Karman vortex street theory to give the spacing, path, and strength of the vortices shed from the body for flow conditions varying from incompressible speeds up to approximately M sub c = 1.0. Author

N70-30114*# Denver Research Inst., Colo.

[SUBSONIC FLOW AND SUPERSONIC CROSS-FLOW NEAR THE CENTER PORTION OF A WING] Final Technical Report

C. W. Chiang 31 Mar. 1970 18 p
(Grant NGR-06-004-082)
(NASA-CR-66966) Avail: CFSTI CSCL 20D

The present work is a study of conical flow of a delta wing which may serve as a representative analysis to distinguish the non-linear effects from the lienarized theory. The present work deals with the complete solution of the compression side of the wing. The whole flow region is divided into a supersonic crossflow region and a subsonic flow region near the center portion of the wing. A system of rotational flow equations is first transformed into dimensionless conical coordinates. In the supersonic cross-flow region, method of characteristics is applied. In the subsonic region a successive solution of non-linear central difference equations by steepest descent from a zeroth solution is used. Author

N70-30182# Aeronautical Research Labs., Melbourne (Australia).

SOME EFFECTS OF BASE GEOMETRY ON TWO DIMENSIONAL BASE DRAG AT SUBSONIC AND TRANSONIC SPEEDS

N. Pollock Oct. 1969 32 p refs
(ARL/Aero-316) Avail: CFSTI

A nominally 6 percent thick blunt trailing edge aerofoil was tested at zero incidence over a Mach number range of 0.5 to 1.2 with a number of different base geometries. All the tests were conducted at zero incidence, with a turbulent boundary layer at the separation points and a boundary layer momentum thickness to base height ratio of 0.037. Tests on a plain blunt base and a base with a central splitter plate one base height long showed that strong wake periodicity persisted up to the top test Mach number. A two dimensional Ringleb cusped cavity base without external suction was tested but the drag reduction achieved was inferior to that given by the splitter plate. A segmented base consisting of alternate portions of Ringleb cusp and plain blunt base spaced across the span, was found to have less drag than the splitter plate base and only about half the drag of each of its constituent parts tested separately. No evidence of a standing vortex was found in the cusped sections and an alternative flow model is presented to explain the measured drag reduction. Author

N70-30371# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

VIBRATION OF NONSYMMETRIC PLATES IN A GAS FLOW

G. A. Marchenko 3 Oct. 1969 8 p refs Transl. into ENGLISH from Politekhnicheskiy Inst., Dinam. i Prochnost Mashin (USSR) no. 6, 1967 p 37-41
(AD-701019; FTD-HT-23-418-69) Avail: CFSTI CSCL 20/4

Critical flutter and divergence parameters are obtained for trapeziform bracket plates with different swing amplitudes and various ratios of parallel sides, placed in a longitudinal gas stream. As an example, the effect is shown of an arrow-shaped rhomboid bracket plate on critical flow rate. A Lagrange equation is given for minor vibration in a thin plate caused by transverse loading, followed by formulas for stability of plate shape and relation to stream parameters, including matrixes of potential and kinetic energy, plus nonconservative loading. Critical flow parameters are tabulated for right-angle trapezoid plates, and vibration forms are illustrated for one such shape. Critical flow parameters for a rhomboid plate are plotted on graphs in relation to sagittal angle of a rear plate edge and of a forward edge. Author (TAB)

N70-30406# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.

LARGE AMPLITUDE SLOW OSCILLATION OF WEDGES IN INVISCID HYPERSONIC AND SUPERSONIC FLOWS

W. H. Hui Mar. 1970 15 p refs
(AASU-301) Avail: CFSTI

The problem of flow over a wedge performing a large amplitude slow oscillation in hypersonic or supersonic flows is studied by perturbing about an instantaneous wedge position anywhere during its oscillation. A simple solution in closed form is obtained which can be applied to wedges of any thickness in both hypersonic and supersonic flows provided the bow shocks on both sides of the wedge are attached. This solution includes the solution of Kuiken as a special case when the flow is hypersonic and the wedge is slender. Author (ESRO)

N70-30409# Von Karman Inst. for Fluid Dynamics, Rhode Saint-Genese (Belgium).

AN INVESTIGATION ON LE FOLL'S METHOD USED FOR BLADE OPTIMIZATION BASED ON BOUNDARY LAYER CONCEPTS

K. Papailiou Aug. 1969 29 p refs Presented at the 20th Intern. Astronaut. Congr., Mar Del Plata, Arg., 5-12 Oct. 1969
(VKI-TN-61) Avail: CFSTI

A procedure has been developed at the Von Karman Institute for the design of optimized compressor blades based on Le Foll's theory for boundary layers and the inverse method for the calculation of potential flows. In this report, Le Foll's method is explained and the investigation used to check his method is described. It is shown that the discrepancies between Le Foll's theory and the experimental results could be attributed to the effect of blade curvature and flow convergence, both of which are not taken into account by Le Foll's method. A method is therefore formulated for including these effects in Le Foll's theory. ESRO

N70-30422# National Aerospace Lab., Amsterdam (Netherlands).

PRESENT STATUS OF UNSTEADY AERODYNAMICS FOR LIFTING SURFACES

H. Bergh and R. J. Zwaan 17 Mar. 1969 32 p refs Presented at 34th Flight Mech. Panel Meeting, Marseille, 21 24 Apr. 1969
(NLR-MP-69004-U) Avail: CFSTI

A survey is given of existing theoretical and experimental routine methods for determining pressure distributions or generalized forces on oscillating lifting surfaces. Some comparisons between results of theory and experiment are shown. Techniques are indicated to apply measured data in development work. Tunnel wall influence on measurements is discussed. Author

N70-30434# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

EUROPEAN WORK ON HYPERSONIC FLOWS. SECTION 1: BOUNDARY LAYERS [TRAVAUX EUROPEENS SUR LES ECOULEMENTS HYPERSONIQUES. SECTION 1: COUCHES LIMITES]

Roger Michel, ed. Sep. 1969 35 p Presented at the European Meeting of Hypersonic Aerodynamics, Cologne, 15 Oct. 1969
(ONERA-TP-770) Avail: CFSTI

Summaries are reported on theoretical and experimental work concerned with laminar, transitional, and turbulent flow along a plane wall; for different Reynolds, Mach, and temperature conditions; with and without pressure gradients; with unswept or swept leading and trailing edges; and different surface roughness. The research is directed towards determining pressures, velocity and temperature profiles, skin friction, heat transfer, displacement effect on external flow, and effect of strong entropy gradients. R.B.

N70-30437# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

CALCULATION OF A SUBSONIC OR TRANSSONIC WING PROFILE [CALCUL D'UN PROFILE D'AILE SUBSONIQUE OU TRANSSONIQUE]

Robert Legendre [1969] 28 p refs In FRENCH; ENGLISH summary Presented at Intern. IUTAM Congr., Stanford, 1968
Avail: CFSTI

The principles of the computation, by the hodograph method, of two dimensional flow around airfoils are discussed. The types of hodographs examined are described, and the methods proposed for computation of subsonic, transonic, and reversible flows are presented. The analytical expressions of the auxiliary fields, pointing out the singularities, are established, and the conditions which guarantee the flow uniformity are given. Author

N70-30440# Aeronautical Research Inst. of Sweden, Stockholm.

THE STABILITY CRITERION FOR VORTICES BY LUDWIEG AND ITS APPLICATION TO SOME EXPERIMENTAL RESULTS

Erik Petersohn 1970 12 p refs
(FFA-119) Avail: CFSTI; Almqvist and Wiksell, Stockholm: SW. KR. 10

It is shown that: for a vortex in a viscous fluid, Ludwieg's stability criterion will give instability in the center of the vortex. Experimental research seems also to confirm this. Author (ESRO)

N70-30589*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FLIGHT AND WIND TUNNEL INVESTIGATION OF INSTALLATION EFFECTS ON UNDERWING SUPERSONIC CRUISE EXHAUST NOZZLES AT TRANSONIC SPEEDS

Daniel C. Mikkelson and Bernard J. Blaha [1970] 9 p refs To be presented at the AGARD 1970 Aerodyn. Interference Specialists Meeting, Silver Spring, Md., 29–30 Sep. 1970; Sponsored by AGARD Fluid Dyn. Panel
(NASA-TM-X-52827) Avail: CFSTI CSCL 20D

To investigate airframe installation effects on exhaust nozzle systems mounted on underwing engine nacelles, a combined flight and wind tunnel test program is being conducted utilizing a modified F-106 aircraft. Flight tests were conducted in the transonic speed regime to determine nozzle performance and boattail drag for variable flap ejector, conical plug, and auxiliary inlet ejector nozzle concepts. Wind tunnel tests were conducted on isolated models of these nozzles and also on a 1/20-scale model of the F-106 aircraft with simulated underwing engine nacelles. Wing and nacelle pressures from these wind tunnel tests are used to qualitatively explain the observed installation effects. The 1/20-scale model was also used to evaluate the effects of changes in nacelle geometry and angle-of-attack. Author

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N70-29222# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.

AIR TRAFFIC SAFETY IMPROVEMENT BY THE FLIGHT SAFETY FOUNDATION [ERHOEHUNG DER SICHERHEIT IM LUFTVERKEHR DURCH ARBEITEN DER FLIGHT SAFETY FOUNDATION]

Hellmut Herb Mar. 1970 41 p refs In GERMAN; ENGLISH summary
(DRL-Mitt-70-08) Avail: CFSTI; Zentralstelle fuer Luftfahrtdokumentation und Inform. (ZLDI), Munich: 9, 80 DM

Each year an international seminar on problems of safety in air traffic is held by the Flight Safety Foundation. The seminars take place in the USA and in Europe alternatively and are concerned with approaches to aircraft accident avoidance. Significant results of the seminars are presented for the years 1967, 1968, and 1969. Author (ESRO)

N70-29269# Lockheed-Georgia Co., Marietta.

THE HUMMINGBIRD XV-4B VTOL RESEARCH AIRCRAFT PROGRAM

Wright-Patterson AFB, Ohio AFFDL Oct. 1969 219 p refs
(Contract F33615-67-C-1035)
(AD-700436; AFFDL-TR-69-75) Avail: CFSTI CSCL 1/3

Contents: Airframe design; Aircraft systems; Aerodynamic chacteristics; Thermo-propulsion analysis; Inverted telescope and balance system; and Test programs. TAB

N70-29314# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

AVIATION TECHNOLOGY, VOLUME 10, NO. 1, 1967 (SELECTED ARTICLES)

A. A. Kuznetsov et al Aug. 1968 30 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Aviats. Tekh. (Kazan), v.

10, no. 1, 1967 p 3-9, 37-44
(AD-685542; FTD-MT-24-210-68) Avail: CFSTI CSCL 1/3

Table of contents: Determination of the cost of an aircraft as a function of weight and drag of the glider units; and Stability of an anistropic circular cylindrical shell under compression and internal pressure. TAB

N70-29401# Advisory Group for Aerospace Research and Development, Paris (France).

AEROELASTIC EFFECTS FROM A FLIGHT MECHANICS STANDPOINT

Mar. 1970 398 p refs Conf. held in Marseille, 21-25 Apr. 1969
Partly in ENGLISH and partly in FRENCH
(AGARD-CP-46) Avail: CFSTI

The conference papers pertain to the state-of-the-art, flight dynamics of flexible VTOL rotors, theoretical and experimental methods for determining the flight dynamics of flexible aircraft, and stability and control augmentation devices. For individual titles, see N70-29402 through N70-29425.

N70-29405# Royal Aircraft Establishment, Farnborough (England).

ATMOSPHERIC TURBULENCE DESIGN CASES

J. Taylor *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 13 p refs (See N70-29401 15-02)
Avail: CFSTI

The underlying principles of the design cases for atmospheric turbulence loads on aircraft are discussed. The turbulence is considered to be made up of a number of patches each of which can be represented by a von Karman three-dimensional spectrum with a normal distribution of crossings of different magnitudes of the turbulence velocity vector. The consequential accelerations at the aircraft centre of gravity are determined and used as a basis for comparing loads and displacements at various parts of a flexible aircraft. Author

N70-29407# Rochester Univ., N.Y.

AEROELASTIC AND STRUCTURAL DYNAMIC INFLUENCES ON V/STOL HANDLING QUALITIES

R. G. Loewy *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 22 p refs (See N70-29401 15-02)
Avail: CFSTI

Recent V/STOL aircraft developments including helicopters, are reviewed considering the influence of structural dynamic and aeroelastic characteristics on handling qualities. Parallels between problems of this kind on large fixed-wing aircraft and those of large helicopters are drawn. Special challenges of stopped-rotor V/STOL's are considered, as are the affects of rotor isolation systems, and other flexible mountings on the stability of aircraft response to control inputs and gust disturbances. A number of cases where the pilot-in-the-loop is important are also discussed. Author

N70-29410# Messerschmitt-Boelkow G.m.b.H., Ottobrunn, (West Germany).

THE INFLUENCE OF AEROELASTICITY ON STABILITY AND CONTROL OF A HELICOPTER WITH A HINGELESS ROTOR

G. Reichert *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 15 p refs (See N70-29401 15-02)
Avail: CFSTI

The Boelkow rotor system features flapwise and lagwise rigid attachment of flexible fiberglass rotorblades of a very stiff hub. The flight mechanics of a helicopter with such a hingeless rotor system is mainly influenced by the aeroelastic behaviour of the rotor blades. The BO 105 was of the rotor blades. The BO 105 helciopter was tested and reported. The results of a parametric study showing the influence of the rotor stiffness on the stability and control characteristics in hovering and forward flight are presented. Additionally, discussion of some aeroelastic coupling effects and instability phenomena in flight are given. Author

N70-29412*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AN ANALYTICAL METHOD FOR PREDICTING THE STABILITY AND CONTROL CHARACTERISTICS OF LARGE ELASTIC AIRPLANES AT SUBSONIC AND SUPERSONIC SPEEDS. PART 1: ANALYSIS. PART 2: APPLICATION

Arthur R. Dusto, Howard L. Chevalier, Gerald M. Dornfield, and Robert C. Schwanz *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 29 p refs Prepared in cooperation with Boeing Co. (See N70-29401 15-02)
Avail: CFSTI CSCL 01C

An analytical method is presented for predicting the stability characteristics of large, flexible airplanes. In this method the aerodynamic and elastic properties of the airplane are described in terms of influence coefficients. This description leads to small disturbance equations of motion for the flexible airplane which appear as two sets of matrix equations. One set governs the motion of the airplane's center of gravity and the second set governs the internal equilibrium of the airplane as an elastic body. They apply to longitudinal as well as lateral-directional motion. The formulation readily permits the use of residual flexibility. This technique introduces the effects of the structural flexibility on the airplane's motion in an optimal manner. These effects are introduced into the small disturbance equations of motion by special modification of the stability derivatives. Author

N70-29413# Kansas Univ., Lawrence.

COMMENTS, INTERPRETATION AND APPLICATION OF A METHOD FOR PREDICTING AERODYNAMIC CHARACTERISTICS OF LARGE FLEXIBLE AIRPLANES

J. Roskam *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 22 p refs (See N70-29401 15-02)
Avail: CFSTI

The potential applications to airplane design of a recently developed method to account for elastic effects on stability, control, and performance characteristics of large flexible airplanes is discussed. The method lends itself well to rapid calculation of trade-off information on which to base design decisions. It is shown how the method can be used to determine the effect of changes in aerodynamic structural and mass configuration on equilibrium and jig shape, lift-to-drag ratio, stability derivatives, and aerodynamic center. An interpretation of elastic airplane stability derivatives is given and it is shown what format these derivatives assume if the conventional rigid airplane equations of motion are to be used. Finally it is shown how the method should be used to massage wind tunnel data obtained on rigid and elastic models before these data can be applied to the full scale airplane. Author

N70-29414# Royal Aircraft Establishment, Bedford (England).

AEROELASTIC RESPONSE TO UNWANTED DISTURBANCES

J. Burnham *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 9 p refs (See N70-29401 15-02)
Avail: CFSTI

The response of aircraft to essentially unwanted disturbances such as gusts and buffeting is briefly reviewed, and the importance of aeroelastic effects is stressed. Mention is made of the use of automatic control systems to modify aeroelastic response to gusts and it is pointed out that similar systems can also have important handling qualities implications, thus suggesting the desireability of an integrated approach to their design. Author

N70-29415# Sud-Aviation, Paris (France).

DETERMINATION OF FLEXIBLE AIRCRAFT AERODYNAMIC COEFFICIENTS IN SYMMETRICAL FLIGHT [DETERMINATION DES COEFFICIENTS AERODYNAMIQUES AVION SOUPLE EN VOL SYMETRIQUE]

A. Marsan In AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 14 p In FRENCH (See N70-29401 15-02)

Avail: CFSTI

The importance of considering aeroelasticity in aerodynamic problems is stressed, and the need for developing new mathematical matrices to calculate aeroelastic effects is discussed. Equations are derived for flexible aircraft aerodynamic coefficients, in terms of Mach number, dynamic pressure, weight and centering. Comparisons are drawn between the formulas used for rigid aircraft and those suitable for flexible aircraft. Transl. by M.G.J.

N70-29418*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

WIND TUNNEL TECHNIQUES FOR THE STUDY OF AEROELASTIC EFFECTS ON AIRCRAFT STABILITY, CONTROL, AND LOADS

A. Gerald Rainey and Irving Abel *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 16 p refs (See N70-29401 15-02)
Avail: CFSTI CSCL 01C

Techniques for wind tunnel studies of a variety of stability, control, and response characteristics of elastic aircraft which are in use at the NASA Langley transonic dynamics tunnel are described. All of these methods employ a dynamic, aeroelastically scaled model supported on a simple two-cable mount system which provides close simulation of free flight conditions. The mount system has proved to be very versatile and with variations, was successfully applied to several different problems. Both static and dynamic control effectiveness and stability derivatives were studied using the basic approach followed in flight testing; namely, measuring the response of the model to known control inputs. Response to sinusoidal gusts were investigated using the basic model-mount system in conjunction with a device to impart sinusoidal gusts to the wind tunnel airstream. And, finally, problems associated with high lift such as buffeting were studied by adding a device to the basic arrangement which compensates for the lift in excess of the model weight without sacrifice of model freedom of movement. Author

N70-29420# Boeing Co., Wichita, Kans.

CONSIDERATION OF STABILITY AUGMENTATION SYSTEMS FOR LARGE ELASTIC AIRCRAFT

Clifford F. Newberry *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 16 p refs (See N70-29401 15-02)
Avail: CFSTI

Use of stability augmentation systems for control of elastic vibration modes of large flexible aircraft is a reality. Design criteria, and development and evaluation of such systems are presented. Examples and illustrations are drawn from three design studies. Two of these studies were for large subsonic aircraft for which the resulting systems were flight tested. The other study is for a large supersonic airplane currently in the design phase. Analytical methods used to develop stability augmentation system concepts are presented and discussed with examples to show significant aspects of the analysis. Results presented show stability augmentation system performance in terms of mode damping, fatigue damage rates, and ride characteristics in turbulence. Comparisons are made of theoretically predicted and experimental results. Limitations encountered in adapting a load alleviation and mode stabilization system to an existing airframe configuration are discussed. Author

N70-29423*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

ANALYTICAL DESIGN AND FLIGHT TESTS OF A MODAL SUPPRESSION SYSTEM ON THE XB-70 AIRPLANE. PART 1: DESIGN ANALYSIS. PART 2: FLIGHT TESTS

John H. Wykes (North Am. Rockwell Corp., Los Angeles, Calif.) and Eldon E. Kordes *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 19 p refs Prepared jointly with North Am. Rockwell Corp. (See N70-29401 15-02)
Avail: CFSTI CSCL 01C

A control system designed to damp the structural motion of flexible airframes was flight tested on the XB-70 airplane, a flexible, low-aspect-ratio supersonic configuration. Even though the system—known as ILAF (Identical Location of Accelerometer and Force)—was an exploratory device and was not developed as an optimum system, the flight tests provided valuable information applicable to aircraft to the supersonic-transport type. The design processes and some preliminary results obtained from flight tests are presented. Author

N70-29424# Engineering Research Associates, Toronto (Ontario)

GUST ALLEVIATION TECHNIQUE ON A LARGE EXPERIMENTAL AIRPLANE

J. A. Mc Killop *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 16 p (See N70-29401 15-02)
Avail: CFSTI

The CAMCO V-Liner, or Helevision as it was originally known is a very long special purpose airplane. Because of its length, light weight and flexibility, it can be expected to be sensitive to gusts. To alleviate this gust sensitivity the wings were given complete freedom in pitch. Such an unusual design feature naturally creates problems of dynamic stability. The examination of these problems as well as the gust alleviation effects are discussed. Author

N70-29618# Advisory Group for Aerospace Research and Development, Paris (France).

PROBLEMS OF THE COCKPIT ENVIRONMENT

Mar. 1970 396 p refs Mostly in ENGLISH; partly in FRENCH Presented at 16th Avionics Panel Tech. Symp., Amsterdam, Nov. 1968
(AGARD-CP-55) Avail: CFSTI

Attention was centered on the problems of determining crew capability under stress; analyzing and measuring information transfer requirements for various missions; correlating crew training, size and composition, and automated assistance; cockpit design instrumentation and information generation; and deriving in-cockpit and head-up information display configurations. For individual titles, see N70-29619 through N70-29647.

N70-29624# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

PROBLEMS OF INFORMATION TRANSFER IN THE MODERN JET COCKPIT

William C. Schultz *In* AGARD Probl. of the Cockpit Environment Mar. 1970 13 p refs (See N70-29618 15-02)
Avail: CFSTI

More emphasis must be placed on improving the chances of acting quickly and properly on the signals that are available, and of maximizing the time to act on signals. Four facets of the problem of improving information transfer in the cockpit are presented: discussion of the gaps which exist in the transfer of information to the pilot of a jet aircraft (e.g., the pilot not having sufficient information to quickly identify certain potentially dangerous flight conditions); a taxonomy of flight safety research; a discussion of how flight safety research might be correlated with careful regard for, and consideration of the above, taxonomy; and a discussion of steps now being taken in a planned experimental approach towards improvement of information transfer in the cockpit. Author

N70-29625# Royal Aircraft Establishment, Bedford (England).

SOME THOUGHS ON V/STOL DISPLAYS AND APPROACH TECHNIQUES

R. M. Millward *In* AGARD Probl. of the Cockpit Environment Mar. 1970 6 p (See N70-29618 15-02)
Avail: CFSTI

The problem of bringing a V/STOL aircraft from a conventional flight regime in the vicinity of a landing site to a position from which the pilot can make a visual vertical or short landing was considered. It was concluded that, for V/STOL approach tasks in IFR conditions: (1) operational minima of 200 ft and 1/2 n.m. should be aimed for; (2) high quality situation information is required, including plan position information relative to the landing site; (3) director displays may be redundant when adequate situation information is provided; (4) the 'stepped' approach offers the best level of pilot confidence and performance; and (5) stability and control characteristics of V/STOL aircraft should be as good as those of conventional low speed aircraft; if necessary, attitude autostabilization should be used to produce the required handling characteristics. Author

N70-29637# Office of Naval Research, Washington, D.C.

VTOL DISPLAYS AND CONTROLS FOR ALL-WEATHER FLIGHT

Francis L. Cundari, Robert M. Nicholson (Honeywell, Inc., Minneapolis), Bernard S. Gurman (ECOM, Ft. Monmouth, N.J.), and Charles A. Baker (Dept. of Transportation) *In* AGARD Probl. of the Cockpit Environment Mar. 1970 30 p refs (See N70-29618 15-02)
Avail: CFSTI

The analytic definition and laboratory demonstration of a representative system which would provide the capability of coordinated formation flight for helicopters under instrument conditions is discussed. This investigation consisted of a series of iterative analyses and real-time man-in-the-loop simulations in order to synthesize an optimal system concept with respect to the information processing and control capabilities of the pilot. The series of fixed-based simulations compared alternative display formats, system data processing characteristics, and autopilot augmentation levels. In the autopilot study the UH-1B and AH-56 helicopters were simulated. The UH-1B was utilized for the other two study phases. The results of this study have shown that the precision of aircraft control in the formation flight mode under instrument flight conditions is a function of the quickened command signals displayed within certain system accuracy and display update rate bounds. Incorporation of limited flight control augmentation reduced the overall workload necessary for the pilot to perform this mission, thus allowing time for the performance of related ancillary tasks. Author

N70-29642# Compagnie Generale de Telegraphie sans Fil, Paris (France).

ELABORATION AND PRESENTATION OF LANDING AID INFORMATION [ELABORATION ET PRESENTATION D'INFORMATION D'AIDE A L'ATTERRISSAGE]

M. J. Jullien *In* AGARD Probl. of the Cockpit Environment Mar. 1970 11 p In FRENCH (See N70-29618 15-02)
Avail: CFSTI

A system for utilizing control and pilot information for landing is explained. The system is based on obtaining precise measurements of the aircraft position by referring to the axis of descent and the ground system at the moment of landing. Results are obtained from simulation on an analog computer of an aircraft landing. Transl. by J.M.C.

N70-29643# Bell Helicopter Co., Fort Worth, Tex.

ADVANCES IN V/STOL COCKPIT INFORMATION

Dora Dougherty-Strother *In* AGARD Probl. of the Cockpit Environment Mar. 1970 7 p refs (See N70-29618 15-02)
Avail: CFSTI

Problems associated with the introduction of new displays into V/STOL and helicopter cockpits are reviewed. These display problems deal with those generated particularly by cathode ray tubes. The use of television as a day and night flight navigation display, and a rotor blade radar display for navigation and landing approach are proposed. Author

N70-29693# Air Force Academy, Colo.

A LINEAR PROGRAMMING APPROACH TO THE LEAST-COST AIR CARGO ROUTING PROBLEM

William T. Hodson, III Feb. 1970 27 p refs
(AD-702440; USAFA-TR-701) Avail: CFSTI CSCL 15/5

Two linear programming models for the least-cost routing of a fleet of cargo aircraft which must deliver specified amounts of cargo during a given planning period are formulated. The first is a multiple-origin single-destination model, while the second is a multiple-origin multiple-destination model. The outputs from the models give the number of sorties to be flown over each leg of the system and the amount of cargo to be flown over those legs. Some anticipated uses for these models are (1) assistance in efficient aircraft scheduling, (2) determination of best routes for new aircraft types during their phase-in periods, (3) cost-effectiveness analysis for enroute bases, and (4) determination of optimal location and size of aerial port and transshipment facilities. Author (TAB)

N70-29903*# National Aeronautics and Space Administration, Washington, D.C.

THE LOGICAL FIGHTER AIRCRAFT [DAS LOGISCHE KAMPFFLUGZEUG]

Edward H. Heinemann Jun. 1970 9 p Transl. into ENGLISH from Flug-Rev. Int. (West Germany), no. 12, 1969 p 39-40
(NASA-TT-F-13117) Avail: CFSTI CSCL 01C

There are great differences in the requirements placed on fighter plane designs by different branches of the armed forces of different countries. However, every superior fighter aircraft must have a design providing for effective interrelation of component parts, and construction teams combining technical skill with experience. Such superior aircraft, the logical fighter aircraft, have proved most economical. A logically designed, high-performance fighter aircraft can be developed at significantly lower cost than a sophisticated model, with minimal disadvantages with respect to military power output. Author

N70-29929# School of Aerospace Medicine, Brooks AFB, Tex.

NOISE GENERATED BY SECONDARY AND AUXILIARY AIRCRAFT SYSTEMS Final Report, 1 Nov. 1967 - 1 Nov. 1968

Donald C. Gasaway Dec. 1969 29 p refs
(AD-702101; SAM-TR-69-83) Avail: CFSTI CSCL 20/1

A variety of noise-generating mechanisms contribute to the overall noise environment encountered within fixed- and rotary-wing aircraft. The report contains descriptions and illustrations of secondary and auxiliary systems found within aircraft which contribute to the composite noise. Types of noise-generating mechanisms include: (1) transmission, gear-reduction, and shaft distribution systems; (2) air-conditioning and pressurization systems; (3) defrosting systems; (4) air-distribution ducts and vents, and air-circulating and blower units; (5) ground and airborne auxiliary power units and systems; and (6) aerodynamic and aeroelastic disturbances, including devices such as air brakes and landing gear. Author (TAB)

N70-29942*# Fabric Research Labs., Inc., Dedham, Mass.

TESTING AND EVALUATION OF DACRON PARACHUTE ELEMENTS AFTER EXPOSURE TO ETHYLENE OXIDE AND SIMULATED PACKAGE LOADING AND HEAT CYCLE

J. Skelton, R. E. Sebring, and K. D. Cragan [1970] 76 p refs
(Contract NAS1-9587)
(NASA-CR-66942) Avail: CFSTI CSCL 01C

Dacron parachute components, and assemblies of these components were exposed to the various environments encountered in a sterilization procedure: ethylene oxide; heat cycle and pressure packing; and a sequential combination of these. After exposure the specimens were examined for dimensional stability, and tested for evidence of degradation, or other changes in important mechanical properties. It was shown that components made from heat-set

Dacron were completely stable, and showed essentially no loss in strength after exposure to the various conditions, either separately or in combination. As a consequence of the dimensional stability the air permeability of the canopy fabric was not changed significantly. The various environmental exposures had the effect of relaxing stresses in the components and assemblies, with the result that some properties such as seam strength were enhanced. The only component tested that was not made from heat-stable Dacron, namely the riser webbing, showed poor dimensional stability, and marked evidence of degradation after heat cycling. Author

N70-30146# Bureau of Meteorology, Melbourne (Australia).

PRELIMIMINARY STUDY OF WIND SHEAR IN THE BOUNDARY LAYER AT MELBOURNE AIRPORT (TULLAMARINE)

R. R. Brook Feb. 1970 96 p refs *Its* Meteorol. Study No. 19

Avail: CFSTI

The wind shear measurement in the boundary layer and its influence on aircraft operations is discussed. The instrumentation and data recording methods used to measure wind shear at Melbourne Airport are described. The data obtained and the results of several treatments of the data are presented. The data are mainly the difference in wind speeds between 150 ft and 50 ft, which is shown to be a good approximation to the component of wind shear in the direction of the mean 150 ft wind. In some runs the cross-wind component of shear could be studied, and relations between the two components are investigated. The coherence between wind speeds at 150 ft and 50 ft is discussed with particular emphasis on its relation to wind shear. The form of the frequency distribution of differences in wind speed is examined and is found to be roughly normal. It is concluded that wind shear may be measured with simple instruments. From the tabulations presented, estimates of the probability of shears exceeding a given magnitude, for a given time interval or longer, may be made. As an example, these probabilities are calculated for shears in excess of 6 kt per 100 ft for 10 sec or more. Author

N70-30219# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik Der Flugsysteme.

MODIFICATION OF PIAGGIO P 149 D TO A VARIABLE-STABILITY PLANE IN THE PITCH DEGREE OF FREEDOM. PART 1: CONSTRUCTION AND TEST OF THE CONTROL LOOP. PART 2: ELECTRICAL COMPONENTS OF THE CONTROL LOOP [UMRUESTUNG EINER PIAGGIO P 149 D ZUM FLUGZEUG MIT WAEHLBAREN EIGENSCHAFTEN IM NICKGESCHWINDIGKEITSKANAL TEIL 1: AUSLEGUNG UND ERPROBUNG DES REGELKREISES. TEIL 2: ELEKTRISCHE KOMPONENTEN DES REGELKREISES]

Bernd Uhrmeister and Otto Hans Schmidt Mar. 1970 71 p refs In GERMAN; ENGLISH summary

(DLR-FB-70-10) Avail: CFSTI; Zentralstelle fuer Luftfahrtdokumentation und Inform. (ZLDI), Munich: 18, 60 DM

Between 1965 and 1967, a Piaggio P149D was modified to a model controlled simulator in the pitch degree of freedom by means of a control loop. The analysis of the control loop in time and frequency domain and in the complex plain which yielded adjustments of the variable loop parameters favorable for the performance of the simulator are described. During flight tests, the behavior of the components in the closed loop and the loop itself was measured in the time and frequency domain. The limits of the simulation field are stated. The development and composition of the electrical components of the control loop and the measurement and recording of the loop variables are also considered. Author (ESRO)

N70-30374# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THEORETICAL BASES OF JUMPING

I. Kravtsov 24 Dec. 1969 18 p Transl. into ENGLISH from Kryl'ya Rodiny (USSR), no. 5, 1969 p 26–28

(AD-702997; FTD-MT-24-314-69) Avail: CFSTI CSCL 1/2

Parachuting techniques from an AN-2 aircraft at 900 m and 800 m are described. Directions are given for chute placement before the jump, opening the chute, chute maneuvering, descent rate, and landing. Author (TAB)

N70-30376# Stanwick Corp., Arlington, Va.

STUDY OF PREFLIGHT PROCEDURES OF GENERAL AVIATION Final Report

D. G. Patterson and J. R. Wiggins Apr. 1970 87 p

(Contract DOT-FA69WA-2160)

(FAA-DS-70-10) Avail: Issuing Activity

Calendar year 1968 accident data is compared with statistical data obtained from responses to a survey questionnaire sent to more than 3200 pilots. Charts were developed to show relationships between accident records and preflight procedures by operator category. One hundred eighty-four fatal general aviation accidents during 1968 could be linked to faulty preflight procedures. The largest number (81) of fatal accidents resulted from pilots proceeding under Visual Flight Rules into unfavorable weather conditions due to poor weather analysis and route planning. The next highest number (42) was caused by pilot impairment due to alcohol. Ninety-nine percent of the pilots report that they plan for more than a half hour fuel reserve for each flight; however, the largest number of nonfatal preflight caused accidents (132) was due to fuel exhaustion. Of the preflight procedure caused accidents in 1968, 82% of the pilots had not filed flight plans of any type. Author

N70-30428# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.

THE DEVELOPMENT OF A SIMPLIFIED ANALYTICAL APPROACH FOR EVALUATION OF THE DYNAMIC STABILITY CHARACTERISTICS OF A DUCTED-PROPELLER VTOL AIRCRAFT IN TRANSITION

[1970] 96 p refs

Avail: CFSTI

The feasibility of utilizing a simplified analytical technique to predict the essential stability and control characteristics of a ducted propeller configuration closely resembling the X-22 V/STOL research aircraft during transition flight conditions is considered. The study followed this basic sequence: Static force and moment characteristics for an isolated duct were obtained experimentally. The aircraft configuration was set up geometrically in terms of duct locations, etc., the equations of motion for the aircraft were derived in terms of forces and moments acting on the ducts. It was possible, therefore, to express the dynamic stability derivatives of the aircraft in terms of static duct derivatives. The dynamic stability derivative expressions were then evaluated for three transition flight conditions. It was concluded that once equipped with sufficiently comprehensive static duct data, the analytical technique developed in the report should afford the designer with an efficient means of evaluating the stability and control characteristics of the ducted propeller VTOL aircraft. Author

N70-30519# Aeronautical Research Labs., Melbourne (Australia).

TECHNIQUE AND RESULTS OF SOME SPIN TRIALS WITH FREE FLIGHT MODELS OF THE GAF-F2 AIRCRAFT

T. N. Pound Jan. 1969 39 p refs

(ARL/A-309) Avail: CFSTI

A free flight model program to investigate the spin and spin recovery characteristics of a training aircraft is described. The model and the test technique with limited range facilities are detailed. Some flight data from wind vanes on a nose probe, airborne accelerometers and rate gyroscopes are given. Author

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines; hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; 22 Nuclear Engineering; and 28 Propulsion Systems.

N70-29273# Defense Documentation Center, Alexandria, Va.
SOLAR CELLS AND SOLAR PANELS, VOLUME 1 Report Bibliography, Jan. 1958 – Oct. 1969
Jan. 1970 114 p refs
(AD-700500; DDC-TAS-69-74-1-Vol-1) Avail: CFSTI CSCL 10/2

An annotated bibliography is provided of documents in which performance characteristics of various solar cells, particularly types containing gallium arsenides, silicon, or cadmium sulfides, are evaluated. Other reports include solar-cell fabrication, development of solar-cell power systems generating higher electrical power levels, in-flight solar-cell degradation studies, and systems for orienting solar panels continuously toward the sun. Author (TAB)

N70-29382*# Naval Ammunition Depot, Crane, Ind.
NASA SPACE CELL TEST PROGRAM Progress Report
30 Apr. 1970 68 p
(NASA Order S-23404-G)
(NASA-CR-110237; Avail: CFSTI CSCL 10C

The acceptance tests performed in the space cell test program are presented. Included are descriptions of tests, and test results. F.O.S.

N70-29499 National Lending Library for Science and Technology, Boston Spa (England).
AIR-ZINC CELL [OGNIWO POWIETRZNO-CYNKOWE]
W. Tomassi et al 28 Nov. 1969 8 p refs Transl. into ENGLISH from Przem. Chem. (Poland), v. 48, no. 4, 1969 p 205–206 In ENGLISH and POLISH
(NLL-M-7978-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

A 0.5 W power, air-zinc cell is described which diffuses oxygen from the atmosphere into the porous silver electrode. The cell has no moving parts, and the flow of the potassium-hydroxide solution is affected by gravity. The consumption of zinc is 1.1 of the theoretical quantity required to generate the electric charge withdrawn. Author

N70-29512*# Hughes Aircraft Co., El Segundo, Calif. Aerospace Group.
STUDY ON INTEGRATION OF SILVER-ZINC BATTERY IMPROVEMENTS Interim Technical Report, 1 Mar. 1969 – 31 Dec. 1969
R. J. Haas and R. A. Steinhauer 31 Dec. 1969 36 p
(Contract NAS5-11579)
(NASA-CR-110245; ITR-3) Avail: CFSTI CSCL 10C

The results of a study to evaluate separately developed silver-zinc improvements when incorporated into one battery are presented. Fabrication techniques, activation and performance test results, and battery failure analyses are included. D.L.G.

N70-29518# Navy Space Systems Activity, Los Angeles, Calif.
SPACE ELECTRICAL POWER SYSTEMS FOR THE MID-1970'S Final Technical Report
Richard V. Silverman Sep. 1969 125 p refs
(AD-701352; NSSA-R40-69-4) Avail: CFSTI CSCL 10/2

An evaluation of candidate electrical power systems capable of providing up to 6.5 kW for an earth orbiting mission is presented in this report. Three power systems could be ready for a mid-1970 launch, if proper funding were provided for development programs. They are: a Solar Cell/Battery System; a Reactor/Thermoelectric System; and a Reactor/Organic Rankine System. The preferred system for the proposed mission is the Reactor/Thermoelectric system, based on its inherent simplicity, lower weight, lower unit costs, and high degree of technology readiness relative to the competing systems. Author (TAB)

N70-29666# Varo, Inc., Plano, Texas. Static Power Div.
TECHNICAL GUIDELINES FOR POWER SOURCE ELECTRONIC VOLTAGE REGULATION AND CONTROL Final Report, 10 Jun. 1968 – 1 May 1969
John W. Sandstrom Fort Monmouth, N.J. ECOM Feb. 1970 49 p
(Contract DAAB07-68-C-0297)
(AD-702237; ECOM-0297-F) Avail: CFSTI CSCL 10/2

The report summarizes the findings of a study to devise concepts for electronic voltage regulation and control of silent primary fueled power source systems. Emphasis was placed on the development of lightweight, highly efficient control and regulation schemes applicable to thermoelectric silent direct energy conversion systems and to hydrazine fuel cells for military field usage. Logistic fuel and weight requirements necessitated the emphasis of high efficiency and lightweight. Simplicity of operator control in start-up, operation, and shutdown sequences as well as load fault protection were also of major concern. The study considered of an evaluation of known system parameters and determination of unknown parameters, a phase in which these parameters were utilized in the optimization of design concepts, a circuit design phase, and, finally, a breadboard test phase to evaluate the performance of the design. Author (TAB)

N70-29759*# Scientific Translation Service, Santa Barbara, Calif.
A NEW TECHNICAL IDEA ON FLYWHEELS [NOUVELLE CONCEPTION TECHNIQUE DES VOLANTS D'INERTIE]
P. Poubeau, ed. Washington Jun. 1970 21 p Transl. into ENGLISH from Nord-Aviation report no. X.S./010/69
(Contract NASw-2035)
(NASA-TT-F-13075) Avail: CFSTI CSCL 13I

Various flywheel applications to satellites are discussed. Several dc motor designs for flywheel systems aboard satellites are considered. Concepts for flywheel bearings, connection members, and casing are described. Author

N70-29807*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
GEOMETRIC PROPERTIES OF A MODIFIED WHIRLING-MEMBRANE SOLAR-ENERGY CONCENTRATOR
John M. Jerke and Atwood R. Heath, Jr. Washington Jun. 1970 43 p refs
(NASA-TN-D-5859; L-6837) Avail: CFSTI CSCL 10B

The geometry of three modified paraboloidal whirling-membrane solar-concentrator models of 3.05-m diameter was measured by using an optical-ray-trace technique. The membranes were fabricated of 0.01-mm-thick aluminized plastic, attached to metal hubs, and rotated at 71 rad/s in a vacuum chamber. Geometric properties such as focal length, mean and standard-deviation errors, and geometric efficiency for three models with different metal-hub diameters are discussed and compared with results for a similar whirling-membrane model of an earlier investigation. Author

N70-29819*# General Electric Co., Erie, Pa.
ALTERNATOR AND VOLTAGE REGULATOR-EXCITER FOR A BRAYTON CYCLE SPACE POWER SYSTEM. VOLUME 2: UNBALANCED ELECTROMAGNETIC FORCES
J. E. Greenwell, E. F. Russell, and L. J. Yeager Washington NASA May 1970 165 p refs
(Contract NAS3-6013)

(NASA-CR-1452; A69-003-Vol-2) Avail: CFSTI CSCL 10B

The unbalanced magnetic forces in a homopolar inductor alternator due to rotor eccentricity were determined both analytically and experimentally. Analytic expressions consisting of cosinusoidal terms are given for forces in the X and Y axes of the stator. Forces were measured through the use of specially constructed end shields instrumented with strain gages. Output from the gages was displayed on an oscilloscope in the form of a Lissajous pattern. A correlation between measured and predicted forces is given. Author

N70-29940*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXPERIMENTAL PERFORMANCE CHARACTERISTICS OF THREE IDENTICAL BRAYTON ROTATING UNITS

Donald G. Beremand, David Namkoong, and Robert Y. Wong [1970] 18 p refs
(NASA-TM-X-52826; E-5722) Avail: CFSTI CSCL 10B

Extensive hot performance testing was completed on three identical Brayton Rotating Units on gas bearings. Each unit was tested in a different type of test installation: the first in BRU performance test rig, the second as part of Brayton gas loop test, and the third as part of a full Brayton engine test powered by an electric heat source. At design conditions of 1600 F turbine inlet temperature and 80 F compressor inlet temperature, BRU output power exceeds the design objectives in all cases. Gas bearing performance in all three units was satisfactory, and differences from unit to unit were minor. Author

N70-29959*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXPERIMENTAL PERFORMANCE OF A 10 kW 1200 HERTZ BRAYTON CYCLE ALTERNATOR AND CONTROLS FOR SPACE POWER

Bill D. Ingle and Heinz L. Wimmer [1970] 15 p refs Proposed for presentation at 5th Intersoc. Energy Conversion Eng. Conf., Las Vegas, Nev., 21-24 Sep. 1970; sponsored by AIAA
(NASA-TM-X-52813) Avail: CFSTI CSCL 10B

The electrical subsystem under test included the alternator and prototype electronic controls consisting of the voltage regulator and speed control. Both steady-state and transient tests were run under vaious system-loading conditions. A summary of the test results is presented. In addition, performance criteria and system-interface problems are described. Author

N70-30138# European Space Research and Technology Center Noordwijk (Netherlands).

SPACE-RATED NICKEL/CADMIUM BATTERIES AND THEIR CHARGE CONTROL

G. Seibert May 1969 48 p refs
(ESRO-TM-138/ESTEC/) Avail: CFSTI

Nickel/cadmium batteries have so far been considered the most suitable for use in spacecraft. They have certain drawbacks, however, such as short cycling life at high depth of discharge and elevated temperature (40 deg C), inadequate gravimetric and volumetric energy density, lack of magnetic cleanliness etc. Possible improvements are suggested. The problem of charge control is examined and means of achieving it electronically and electrochemically are explained. A program of acceptance tests by which batteries may be vetted for space application is added as an appendix. Author (ESRO)

N70-30140# British Aircraft Corp., Filton (England). G. W. Technical Publications Dept.

A STUDY OF ADVANCED SOLAR ARRAY DESIGN Quarterly Report, 1 Aug. - 31 Oct. 1969

K. K. Reinhartz, comp. (ESTEC) and D. W. Mann, comp. Paris ESRO Nov. 1969 52 p Sponsored by ESRO Prepared jointly with E. Turner (Elec. Instr.) Ltd.
(Contract ESTEC-623/68sl)
(ESRO-CR-12; QR-3) Avail: CFSTI

This third quarterly report (See also ESRO-CR-7; QR-1; N70-11061 and ESRO-CR-9; QR-2) on solar array design deals with the mechanical system, cell attachment, quality assurance, panel design, cushioning materials, array frequency response, and discusses future tasks. Author (ESRO)

N70-30145# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PLASMA THERMAL EMISSION ENERGY CONVERSION

I. P. Stakhanov et al 9 Jan. 1969 320 p refs Transl. into ENGLISH of the publ. "Plazmennoye Termozmissionnoye Preobrazovani Ye Energii" USSR, 1968 p 1-392
(AD-703170; FTD-MT-24-374-69) Avail: CFSTI CSCL 10/2

The problem of obtaining electrical energy directly, without use of machines with moving parts, has now obtained practical value. The development of direct conversion will essentially influence power engineering in the near future. Atomic power engineering assumes the creation of reactors-generators in which electric energy is produced in the actual reactor, without turbines and generators of electric current. The offered monograph is dedicated to physics of low-temperature plasma utilized in plasma thermoemission energy converters. A classification of various operating conditions of a converter and transport theory for a 3-component plasma (electrons, ions, atoms) are given. Volt-ampere characteristics and distribution of density, temperature and the electrical field between electrodes are investigated in different conditions. A method of experimental investigations is expounded. Results of calculation are compared with experiments. The influence of different impurities on work of a cesium thermoemission converter is investigated. Author (TAB)

N70-30189*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PERFORMANCE OF THE ELECTRICALLY-HEATED 2 TO 15 kWe BRAYTON POWER SYSTEM

John L. Klann, Richard W. Vernon, David B. Fenn, and Henry C. Block [1970] 8 p refs
(NASA-TM-X-52824; E-5721) Avail: CFSTI CSCL 10B

Initial results from two separate tests of the power conversion system are presented and compared to performance predictions. These results are based on 2250 hours of accumulated testing. About 1000 hours of that time was continuous operation at design temperatures in a vacuum-chamber test. No major technological problems were encountered in system operation. With the design working gas mixture of helium and xenon and at design temperatures, a gross alternator power output up to 12 kilowatts was demonstrated in these initial tests. The corresponding measured power-conversion-system gross efficiency was 33 percent with an estimated net efficiency of 29 percent. Measured conversion efficiencies with the gas mixture of helium and xenon were about 1 percentage point below the predicted level. Measured krypton efficiencies at design temperature exceeded predictions by about 2 percentage points. Author

N70-30210# European Space Research and Technology Center, Noordwijk (Netherlands).

CALIBRATION OF SOLAR CELLS

K. H. David Nov. 1969 15 p refs Presented at the 6th ESRO Summer School, Noordwijk, Neth., 1968
(ESRO-TN-79) Avail: CFSTI

Reasons are given for the interest in standard solar cells accurately calibrated in respect of AMO (Air Mass Zero) short-circuit current. Calibration of solar cells can be performed onboard a satellite or a balloon. Another method rests on the determination of the absolute spectral response of the cells. Calibrations of solar

cells in respect of AMO short-circuit current can also be obtained from measurements in terrestrial sunlight at different solar elevations. The principles of these methods are outlined and their mutual advantages and disadvantages are discussed.
Author (ESRO)

N70-30226# European Space Research Organization, Paris (France).
PROCEEDINGS OF THE SIXTH ESRO SUMMER SCHOOL. VOLUME 8: SPACE POWER SYSTEMS: PHOTOVOLTAIC ENERGY CONVERSION
Nov. 1969 120 p refs Partly in ENGLISH and partly in FRENCH Conf. held at Noordwijk, Neth., 1968
(ESRO-SP-47) Avail: CFSTI

CONTENTS:

1. THEORY OF THE PHOTOVOLTAIC EFFECT J.J. Loferski (Brown Univ., USA) p 1-12 refs (See N70-30227 15-03)
2. PHOTOVOLTAIC SOLAR ENERGY CONVERSION J. J. Loferski (Brown Univ., USA) p 13-30 refs (See N70-30228 15-03)
3. PERFORMANCE OF ACTUAL SOLAR CELLS J. J. Loferski (Brown Univ., USA) p 31-45 refs (See N70-30229 15-03)
4. RADIATION EFFECTS ON SILICON SOLAR CELLS J. J. Capart (ESRTC) p 47-75 refs (See N70-30230 15-03)
5. THIN-FILM SOLAR CELLS K. H. Heffels (ESRTC) p 77-93 refs (See N70-30231 15-03)
6. CALIBRATION OF SOLAR CELLS K. H. David (ESRTC) p 95-104 refs (See N70-30232 15-03)
7. PROBLEMS OF SOLAR-CELL TESTING G. Seibert (ESRTC) p 105-116 refs (See N70-30233 15-03)

N70-30227# Brown Univ., Providence, R.I.
THEORY OF THE PHOTOVOLTAIC EFFECT
J. J. Loferski *In* ESRO Proc. of the 6th ESRO Summer School. Vol. 8: Space Power Systems: Photovoltaic Energy Conversion Nov. 1969 p 1-12 refs (See N70-30226 15-03)
Avail: CFSTI

A brief history of photovoltaic energy conversion is presented. Basic concepts of semiconductor theory which are relevant to an understanding of the photovoltaic effect (optical absorption, doping, p-n junctions) are discussed and equations for the current-voltage characteristics of a photovoltaic cell are deduced. An equivalent circuit based on these equations is described. Author (ESRO)

N70-30228# Brown Univ., Providence, R.I.
PHOTOVOLTAIC SOLAR ENERGY CONVERSION
J. J. Loferski *In* ESRO Proc. of the 6th ESRO Summer School. Vol. 8: Space Power Systems: Photovoltaic Energy Conversion Nov. 1969 p 13-30 refs (See N70-30226 15-03)
Avail: CFSTI

Expressions for the maximum power, current, and voltage to a matched load connected across an illuminated photovoltaic cell are derived along with ones for the maximum efficiency for conversion of monochromatic, black-body, and solar radiation. The expressions depend on the reverse saturation current i sub r and the short-circuit current i sub s of the illuminated photovoltaic cell. The physical origins of these two parameters are considered in detail and expressions for the spectral response of the cells are derived. Expressions for the solar energy conversion efficiency of photovoltaic solar cells as a function of energy gap are also presented. Author (ESRO)

N70-30229# Brown Univ., Providence, R.I.
PERFORMANCE OF ACTUAL SOLAR CELLS
J. J. Loferski *In* ESRO Proc. of the 6th ESRO Summer School Vol. 8: Space Power Systems: Photovoltaic Energy Conversion Nov. 1969 p 31-45 refs (See N70-30226 15-03)
Avail: CFSTI

The factors responsibe for the differences between the theoretical and observed efficiencies of silicon cells are discussed. These include the internal series and shunt resistances, the values of minority carrier lifetime and diffusion length, and surface recombination losses and reflection and transmission losses. The temperature dependence of cell parameters is discussed and its relation to output power and voltage is considered.
Author (ESRO)

N70-30230# European Space Research and Technology Center, Noordwijk (Netherlands).
RADIATION EFFECTS ON SILICON SOLAR CELLS [EFFET DES RADIATIONS SOLAIRES SUR LES PILES SOLAIRES AU SILICIUN]
J. J. Capart *In* ESRO Proc. of the 6th ESRO Summer School Vol. 8: Space Power Systems: Photovoltaic Energy Conversion Nov. 1969 p 47-75 refs In FRENCH (See N70-30226 15-03)
Avail: CFSTI

Radiation effects are probably the most important factor in designing silicon cells and affect not only their use onboard satellites but their improvement as well. This report discusses degradation mechanisms and their prediction and describes the latest methods of damage prevention. The useful bibliography is also given. Author (ESRO)

N70-30231# European Space Research and Technology Center, Noordwijk (Netherlands).
THIN-FILM SOLAR CELLS
K. H. Heffels *In* ESRO Proc. of the 6th ESRO Summer School Vol. 8 Space Power Systems: Photovoltaic Energy Conversion Nov. 1969 p 77-93 refs (See N70-30226 15-03)
Avail: CFSTI

The potential and limitations of single-crystal solar cells for large-area arrays are reviewed and general design requirements, possibilities, and problems in thin-film solar cell construction are discussed. The state of the art in the fabrication of gallium arsenide, cadmium sulphide, and cadmium telluride thin-film solar cells is reviewed and details of their characteristics are given.
Author (ESRO)

N70-30232# European Space Research and Technology Center, Noordwijk (Netherlands).
CALIBRATION OF SOLAR CELLS
K. H. David *In* ESRO Proc. of the 6th ESRO Summer School Vol. 8: Space Power Systems: Photovoltaic Energy Conversion Nov. 1969 p 95-104 refs (See N70-30226 15-03)
Avail: CFSTI

Reasons are given for the interest in standard solar cells accurately calibrated in respect of AMO (Air Mass Zero) short-circuit current. Calibration of solar cells can be performed onboard a satellite or a balloon. Another method rests on the determination of the absolute spectral response of the cells. Calibrations of solar cells in respect of AMO short-circuit current can also be obtained from measurements in terrestrial sunlight at different solar elevations. The principles of these methods are outlined and their mutual advantages and disadvantages are discussed.
Author (ESRO)

N70-30233# European Space Research and Technology Center, Noordwijk (Netherlands).
PROBLEMS OF SOLAR CELL TESTING
G. Seibert *In* ESRO Proc. of the 6th ESRO Summer School Vol. 8: Space Power Systems: Photovoltaic Energy Conversion Nov. 1969 p 105-116 refs (See N70-30226 15-03)
Avail: CFSTI

The problems posed by solar-cell testing are discussed. The topics considered include instrumentation for accurate prediction of I-V characteristics, artificial light sources commonly used to measure solar-cell output in the laboratory, and methods of calculating the output of a cell on a satellite based on such laboratory measurements. Advantages and disadvantages of various methods of testing solar cells are presented. Author (ESRO)

N70-30267# Army Electronics Command, Fort Monmouth, N.J. Electronic Components Lab.

ENGINEERING EVALUATION OF ZINC-SILVER OXIDE BATTERY BB-622B/U USED WITH RADAR SET AN/PPS-5

Erminio J. Settembre Jan. 1970 38 p
(AD-700959; ECOM-3213) Avail: CFSTI CSCL 10/3

A long life, high energy density, zinc-silver oxide battery, capable of high power output, was developed to meet the demand for a lightweight high power source for use with Radar Set AN/PPS-5. Batteries capable of one year activated shelf stand and one one-hundred (plus) life cycles are now attainable. These batteries are shipped in the unactivated state and are supplied with premeasured amounts of electrolyte in sealed plastic containers. Before use, they are filled and charged. The BB-622/A was improved in two generations and the improved battery evaluated over a range of conditions to establish capacity, cycle life and environmental qualities. This evaluation was conducted by simulating the Radar Set AN/PPS-5 requirements. Comparative test data of the original battery and the improved BB-622/A show a threefold increase in cycle life at room temperature and a twofold gain at 113F for the improved battery. The present BB-622B/U in a monoblock structure results in a battery of approximately thirty percent greater capacity in the same volume. Cost data on a per cycle basis and watthour basis are presented for the commercial product and the improved BB-622B/U. Author (TAB)

N70-30457*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

DC POWER SUPPLY FOR GASEOUS DISCHARGE LAMPS

D. Huguenin and W. Freeman Paris ESRO Jan. 1968 25 p
(NASA-TM-X-62988; ESRO-TM-146) Avail: CFSTI CSCL 10B

The design of a power supply to feed continuous-flow hydrogen lamps in vacuum UV photometric equipment is discussed. Following a general description, the electrical specifications, circuit description, and procedure for use and maintenance of such a power supply are given, together with a voltage chart and list of main parts. Finally, alternate embodiments of the power supply and features believed to be new are presented. Author (ESRO)

N70-30476# Weapons Research Establishment, Salisbury (Australia).

THE DESIGN AND DEVELOPMENT OF THE WRESAT ELECTRICAL SYSTEM

A. D. Hind and C. J. Beach Nov. 1969 35 p refs
(WRE-TN-HSA-160) Avail: CFSTI

This report discusses the electrical system, power supplies and priming used in the Weapons Research Establishment satellite. A summary of the environmental tests carried out during the satellite preparation is included. Measurements of the ascent and orbital temperatures together with the housekeeping voltages are given. Author

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N70-29221# Federal Aviation Administration, Oklahoma City, Okla. Office of Aviation Medicine.

EXPERIMENTAL COMPARISON OF TRAUMA IN LATERAL (+G SUB y), REARWARD-FACING (+G SUB x), AND FORWARD-FACING (−G SUB x) BODY ORIENTATIONS WHEN RESTRAINED BY LAP BELT ONLY

Richard G. Snyder, Clyde C. Snow, Joseph W. Young, G. Townley Price, and Peter Hanson Jul. 1969 25 p refs
(FAA-AM-69-13) Avail: CFSTI

Twenty-four anesthetized Savannah Baboons (Papio cynocephalus) restrained with a lap belt were subjected to a controlled series of lateral impacts at entrance velocities ranging from 36.4 ft./sec. (15g.) to 88.2 ft./sec. (44g.) 1,200 g./sec. to 5,900 g./sec. rate of onset, for total durations of 0.076 to .100 second. Sixteen lateral tests were run with four forward-facing and four rearward-facing controls. Gross and microscopic autopsies were performed. Pathology was found to be significantly higher in lateral impact. Ruptured bladders and uteri, adrenal hemorrhage, and subdural and epidural hemorrhage occurred frequently. A major finding, with unexplained etiology, was marked pancreatic hemorrhage most typical of the lateral impact. Under these test conditions, both survival and injury tolerance levels were found to be lower in the lateral body orientation, indicating lap belt restraint alone does not provide adequate body protection. Author

N70-29302*# Exotech, Inc., Washington, D.C.

ANALYTICAL TECHNIQUES IN PLANETARY QUARANTINE

Final Report

May 1970 137 p refs
(Contract NASw-1734)
(NASA-CR-110224; TRSR-70-13) Avail: CFSTI CSCL 06F

CONTENTS:

1. INTRODUCTION AND SUMMARY [OF ANALYTICAL TECHNIQUES IN PLANETARY QUARANTINE] 19 p refs (See N70-29303 15-04)
2. POTENTIAL EFFECTS OF RECENT FINDINGS ON SPACECRAFT STERILIZATION REQUIREMENTS, APPENDIX A L. B. Hall (NASA. Washington, D.C.), S. Schalkowsky, and R. C. Kline 18 p refs (See N70-29304 15-05)
3. INVESTIGATIONS INTO A DIFFUSION MODEL OF DRY HEAT STERILIZATION, APPENDIX B M. J. Barrett 18 p refs (See N70-29305 15-04)
4. AN ANALYTICAL BASIS FOR ASSAYING BURIED BIOLOGICAL CONTAMINATION, APPENDIX C R. C. Kline and P. L. Randolph 30 p refs (See N70-29306 15-05)
5. THE RELEASE OF BURIED MICROBIAL CONTAMINATION BY AEOLIAN EROSION, APPENDIX D M. J. Barrett and J. L. Woodall 16 p refs (See N70-29307 15-04)
6. IMPLEMENTATION OF A CHEMICAL CONTAMINANT INVENTORY FOR LUNAR MISSIONS, APPENDIX E 35 p refs (See N70-29308 15-04)

N70-29303*# Exotech, Inc., Washington, D.C.

INTRODUCTION AND SUMMARY [OF ANALYTICAL TECHNIQUES IN PLANETARY QUARANTINE]

In its Anal. Tech. in Planetary Quarantine May 1970 19 p refs
(See N70-29302 15-04)
Avail: CFSTI CSCL 06M

Results of work to support the NASA Planetary Quarantine Office are reported. The four areas discussed include review and interpretation of planetary quarantine requirements, analysis of microbial survival, development and application of pertinent analytical techniques, and implementation of a lunar chemical contamination inventory. Author

N70-29305*# Exotech, Inc., Washington, D.C. Systems Research Div.

INVESTIGATIONS INTO A DIFFUSION MODEL OF DRY HEAT STERILIZATION, APPENDIX B

M. J. Barrett *In its* Anal. Tech. in Planetary Quarantine May

1970 18 p refs (See N70-29302 15-04)
(TRSR-041) Avail: CFSTI CSCL 06M

The analytical model described formalizes the hypothesis that dry heat inactivation of microorganisms is closely related to the water content of the spore and its micro-environment. Experimental data are examined relative to this model and it appears to be valid. The model is aimed at overcoming the well known deficiencies of the logarithm model. Author

N70-29307*# Exotech, Inc., Washington, D.C.
THE RELEASE OF BURIED MICROBIAL CONTAMINATION BY AEOLIAN EROSION, APPENDIX D
Matthew J. Barrett and J. Lyndon Woodall *In its* Anal. Tech. in Planetary Quarantine May 1970 16 p refs (See N70-29302 15-04)
(TRSR-70-14) Avail: CFSTI CSCL 06F

The impact of a lander on a planet could have serious consequences if it is desired not to contaminate the planet. The implications of fracturing and exposing of surfaces which might instantaneously or subsequently release viable spores are considered. The relatively slow process of erosion is discussed, although the fracture and the erosion phases are not necessarily independent. The fracture is assumed to have occurred and is characterized by a fracture-ratio. The fracture-ratio is defined as the area exposed through fracture divided by the volume of the sample. An expression for the erosion of spherical shaped particles and an expression for the probability of release given that a quantity of the sample erodes in the quarantine period are derived. Calculations based on experimental data are made for the erosion rate. Author

N70-29308*# Exotech, Inc., Washington, D.C.
IMPLEMENTATION OF A CHEMICAL CONTAMINANT INVENTORY FOR LUNAR MISSIONS, APPENDIX E
In its Anal. Tech. in Planetary Quarantine May 1970 35 p refs (See N70-29302 15-04)
(TRSR-70-07) Avail: CFSTI CSCL 06F

The study represents the initial step in the implementation of the given approach in that it considers the detailed procedures and tasks to be undertaken to collect, evaluate, store and disseminate data which will serve anticipated needs of lunar sample investigators, consistent with the requirement that costs associated with implementation and operation of the inventory be consistent with known needs for this information. The primary tasks pertinent to this effort involved: (1) determining the availability of lunar mission vehicle documentation and the means for collecting it in a form suitable for future evaluation; (2) the collection and utilization of spacecraft trajectory parameters, landing sites, and dispersion patterns for crash and soft landings, and (3) evaluating the compatibility of required data inputs with the existing planetary quarantine information system. Author

N70-29310# Oakland Univ., Rochester, Mich. Inst. of Biological Sciences.
BIOCHEMICAL STUDIES ON THE OCULAR LENS IN RELATION TO CATARACTOGENESIS Progress Report, 1 Dec. 1968 – 31 Jan. 1970
V. Everett Kinsey and V. N. Reddy 31 Jan. 1970 14 p
(Contract AT(11-1)-2012)
(COO-2012-4; PR-4) Avail: CFSTI

The onset of cataracts following exposure to ionizing radiation is accompanied by a fall in the concentration of glutathione (GSH). In view of this, a C-14 tracer study was designed to determine whether variations in the permeability of the lens surface membrane were responsible for the phenomenon. Barring the existence of an extended latent period, which is currently under study, it was found that x irradiation did not alter the permeability of the lens membrane to GSH. Research is also continuing in the investigation of the source of the potential difference that exists between the inside and the outside of the lens. Results of experiments involving the movement of chlorides across the membrane strongly suggest that sodium is actively transported across the membrane and that this is responsible for the current. It was further concluded that the negative lens fiber potential results from the action of this sodium pump. NSA

N70-29333 Mississippi Southern Coll., Hattiesburg.
A CORRELATIONAL ANALYSIS OF MONAURAL TEMPORAL SUMMATION AND LOCALIZATION
Jane Vivian May (Ph.D. Thesis) 1969 93 p
Avail: Univ. Microfilms: HC $4.80/Microfilm $3.00 Order No. 69-20154

The purpose of this study was to investigate the relationship between the ability to monaurally match brief stimuli and to binaurally localize these stimuli in space, in order to explore the role time sensitivity of individual ears plays in ability to localize tones. Thirty subjects, fourteen males and sixteen females, served as experimental subjects. The task of the subject consisted of matching durations of a series of pure tones for each ear, and localizing these tones free field. Analysis of the results indicated that the ability of the left ear to match durations and detect azimuths was better than that of the right ear. Correlation coefficients of measures indicated that relationships between the ears for duration matching were dependent upon the duration of the tone, whereas the relationships for localization were dependent upon frequency. Dissert. Abstr.

N70-29346# Institute for Cancer Research, Philadelphia, Pa.
STUDIES OF THE EFFECTS OF ULTRAVIOLET RADIATION ON CELL STRUCTURE AND BEHAVIOR Annual Progress Report, Jan. – Nov. 1969
Jerome J. Freed 8 Dec. 1969 14 p refs
(Contract AT(30-1)-2356)
(NYO-2356-36) Avail: CFSTI

Two haploid lines of frog cells were found to be chromosomally stable through more than 200 generations in culture. From the more vigorous line chemical mutagens were used to elicit a high yield of clones resistant to BUdR; all of these appeared to lack the enzyme thymidine kinase. The haploid line, which has a single nucleolar organizer, proved useful in studies of nucleolar function. As a result of studies on puromycin resistance, a stable and highly resistant heteroploid line with useful marker chromosomes was derived. Resistance to both puromycin and actinomycin D is associated with restricted incorporation of the drugs. Electron microscope studies were conducted on HeLa cells to determine the relationship of cell motility to the cytoplasmic microtubule system. Measurements of the rate of cell spreading after subculture by the trypsin procedure suggested that microtubules were required for extension of the cells on a growth surface. NSA

N70-29376*# Sandia Corp., Albuquerque, N.M. Planetary Quarantine Dept.
USER'S MANUAL FOR PLANETARY QUARANTINE LUNAR PROGRAMS INFORMATION SYSTEM USING THE CDC 217 REMOTE CONSOLE
A. L. Wyer and A. L. Roark Oct. 1968 31 p refs
(NASA Order R-09-019-040)
(NASA-CR-110339; SC-M-68-602) Avail: CFSTI CSCL 06M

Portions of the research report describing the planetary quarantine computer programs and portions of the computer manufacturer's instructions were extracted, rearranged, and combined to provide the remote console operator with a workable set of instructions. Author

N70-29377# Department of the Army, Fort Detrick, Md. Protection Branch.
COMPARISON OF MICROBIAL CONTAMINATION LEVELS ON BARBAC AND COTTON HERRINGBONE TWILL CLOTH
Dorothy M. Portner 16 Dec. 1968 8 p ref

(NASA Order R-35)
(NASA-CR-110338; Rept-6-69) Avail: CFSTI CSCL 06M

An investigation to determine whether the cloths repel microorganisms and to determine a decontamination procedure for astronauts' isolation garments is reported. Pieces of cloth in vertical and horizontal positions were contaminated by natural aerial fallout by an artificial aerosol. Greater contamination was found in pieces in the horizontal position than in the vertical one, but no significant difference was noted between the barbac and the control twill. Air resistance of the cloth was tested before and after treatment with hair spray, and it is felt that the use of hair spray does aid in preventing microorganisms from passing through a garment.
N.E.N.

N70-29383*# Naval Aerospace Medical Inst., Pensacola, Fla.
GROWTH OF 'STAPHYLOCOCCUS AUREUS' IN A NULL MAGNETIC FIELD ENVIRONMENT
Dietrich E. Beischer and Glenda S. Cowart 23 Apr. 1970 10 p refs
(NASA Order W-12766; NASA Order ER-19841)
(NASA-CR-110239) Avail: CFSTI CSCL 06M

No significant differences were observed between the growth of S. aureus in the geomagnetic field with a field strength reduced by a factor of 1000. Pigmentation, mannitol fermentation, gelatinase activity, coagulase production, and catalase activity were also not influenced by the low magnetic field. The results are discussed in their relation to previous findings of R. O. Becker who observed a reduction of growth rate in fields of lower field strength than the geomagnetic field.
Author

N70-29400 National Lending Library for Science and Technology, Boston Spa (England).
EQUIPMENT AND MATERIALS FOR THE TROPICS
Z. G. Razumovskaya et al 25 Jan. 1970 9 p refs Transl. into ENGLISH from Opt.-Mekh. Prom. (USSR), no. 3, 1957 p 69–72
(NLL-RRE-Trans-258A-(8036.625)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

The growth of fungi spores on the glasses of optical instruments was investigated. Observations showed that the fungi tested grew best of all on quartz, the surface of which is neutral for them. In individual trials, the development of the fungi mycelia was abundant on the TF4, BF17, K8, and TK16 types of glass. In the case of KF3, either no development of fungi occurred or only the growth of a few spores and a little development of mycelia was observed. This glass contains a large amount of alkali which is liberated by the moisture and this, probably, was the reason for the poor development of the fungi. The nature of the growth and the intensity of the development were assessed.
J.M.C.

N70-29461# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PAPERS ON THE PSYCHOPHYSIOLOGY OF LABOR OF ASTRONAUTS (COLLECTION OF ARTICLES)
F. P. Kosmolinskiy et al 24 Sep. 1968 203 p refs Transl. into ENGLISH from the Publ. "Ocherki Psikhofiziologii Truda Kosmonavtov" Moscow, Meditsina, 1967 p 3–167
(AD-684690; FTD-MT-24-310-68) Avail: CFSTI CSCL 5/10

Contents: Peculiarities of the work activity of astronauts during prolonged space flight; The physiological basis of human adaptation to specific conditions of activity; Sensory deprivation in space flight; Influence of various conditions of work and rest on the functional state of man during a prolonged stay in a pressurized chamber; Influence of the change of the regime of diurnal activity on the human organism under conditions of isolation; The significance of muscular activity in preserving the stability of the motor function of the astronaut; and investigation of the motor function of man under conditions of a modified diurnal regime.
TAB

N70-29514# Kansas State Univ., Manhattan. Dept. of Psychology.
INTEGRATION OF RESPONSES BETWEEN DIFFERENT TYPES OF CONES AND BETWEEN RODS AND CONES
Joseph William Metz and John Lott Brown Jan. 1970 44 p refs
(Contract Nonr-3634(04))
(AD-701328; TR-11) Avail: CFSTI CSCL 6/16

Separation and identification of function of rods and cones in a mixed receptor population was achieved. Threshold level mixtures of two monchromatic stimuli with varying degrees of spectral separation showed the degree of integration of response between different receptor types. A small degree of integration of response was observed between rods and long wavelength cones. As the two monochromatic stimuli became more spectrally separated the degree of integration between different cone types decreased gradually. This was accounted for in terms of a trichromatic-opponent theory of color vision. A much larger degree of integration between different cone types was observed in the parafovea than had been observed in the fovea by previous investigators. A possible difference in the way the three cone mechanisms interact in the fovea and parafovea was suggested.
Author (TAB)

N70-29607# Pittsburgh Univ., Pa. Dept. of Pharmacology.
VESTIBULAR FUNCTION AND SPATIAL ORIENTATION Final Report, 15 Sep. 1965 – 14 Sep. 1969
Gerhard Werner 9 Feb. 1970 30 p refs
(Grant AF-AFOSR-1005-66)
(AD-701093; AFOSR-70-0336TR) Avail: CFSTI CSCL 6/16

The project was concerned with the study of the quantitative aspects of the neural activity in primary afferent nerve fibers from the vestibular organ, recorded with microelectrodes at the entry of the vestibular nerve into the brain stem; and with the characterization of the activity of individual second-order neurons in the vestibular nuclear complex. The emphasis was, firstly, on the determination of the quantitative relation between measures of single unit activity and precisely monitored position of the animal preparation in the gravitational field; and secondly, on the acquisition of these data in animal preparations which are not subjected to general anesthesia, and with the central nervous system entirely intact.
Author (TAB)

N70-29671# School of Aerospace Medicine, Brooks AFB, Tex.
PROCEEDINGS OF THE SIXTEENTH ANNUAL CONFERENCE OF AIR FORCE BEHAVIORAL SCIENTISTS
Jack A. Davis, ed. Nov. 1969 180 p refs Conf. held at Brooks AFB, Tex., 20-22 Jan. 1969
(AD-702102) Avail: CFSTI CSCL 6/5

Contents: A group counseling and group counselor training program in an Air Force corrections setting; U.S. Air Force psychiatry in the Republic of South Vietnam 1967; The effect of observed violence on group and individual behavior; The CHAP clinic; Learning failure; Common errors in technique in parent group therapy; Staff reactions to the readmission of psychiatric patients; Relatedness of birth order to sucesses in aviation; A second look at fear of flying; The marathon group in the military; Chaplaincy sponsored group therapy-a military treatment modality without jeopardy; The Air Force psychiatry clinic viewed as a complicated small group; T group experience and level of performance in USAF hospital corpsmen; A modification of psychodrama as employed at the malcolm grow USAF hospital-some roles and their employment; Introduction to group psychotherapy; and Transactional analysis and the group therapist.
TAB

N70-29713 National Lending Library for Science and Technology, Boston Spa (England).
THE DANGERS CAUSED BY OXIDES OF NITROGEN AND METHODS USED FOR THEIR PREVENTION [NEBEZPECHI KYSLICHNIKU DUSIKU A MOZHNOSTI JEJICH

ZNESHKODNHOVANI]
J. Frkal 1970 10 p ref Transl. into ENGLISH from Uhli (Prague), v. 11, no. 2, 1969 p 64 – 66
(NLL-SMRE-Trans-5764-(8313.4)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

The effects of oxides of nitrogen produced by shotfiring in mines are discussed with respect to their effects on the human organism. The oxides are also shown to act as an active catalyst to ignition of an explosive mixture of methane and air. Two methods are considered for reducing the concentration of oxides of nitrogen produced in mining operations. R.B.

N70-29733*# National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Apr. 1970 108 p refs
(NASA-SP-7011(75)) Avail: CFSTI CSCL 06E

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N70-29784# California Univ., Berkeley. Dept. of Cell Physiology.
ENZYME SYSTEMS IN PHOTOSYNTHESIS Final Report
Daniel I. Arnon 22 Dec. 1969 18 p refs
(Contract Nonr-3656(20))
(AD-700303) Avail: CFSTI CSCL 6/1

Contents include: Mechanism of nicotinamide adenine dinucleotide phosphate reduction; Ferredoxin and oxygen evolution; Ferredoxin and noncyclic photophosphorylation; Ferredoxin and cyclic photophosphorylation; Separation of cyclic and noncyclic photophosphorylation; Activation of fructose diphosphatase by reduced ferredoxin; Ferredoxin and CO2 assimilation. TAB

N70-29788# Pittsburgh Univ., Pa. Dept. of Occupational Health.
FEASIBILITY STUDY OF THE CORRELATION OF LIFETIME HEALTH AND MORTALITY EXPERIENCE OF AEC AND AEC CONTRACTOR EMPLOYEES WITH OCCUPATIONAL RADIATION EXPOSURE Progress Report, 1 Aug. 1968 – 31 Jul. 1969
Thomas F. Mancuso, Barkev S. Sanders, and Allen Brodsky 31 Dec. 1969 216 p refs
(Contract AT(30-1)-3394)
(NYO-3394-11; PR-5) Avail: CFSTI

Progress is reported on a five-year study to test, in selected atomic energy installations, the predicted feasibility of carrying out an epidemiological investigation of the correlation of lifetime health and mortality data with occupational radiation exposure in AEC installations. The purpose of the ultimate study would be to ascertain empirically whether there were any lasting biological effects from radiation exposure received from employment in these installations since they came into operation. The feasibility of concluding a meaningful study with the available data has essentially been established. Except for some of the very early contractors, and the recent whole-body counting data, all radiation exposure records at Hanford and Oak Ridge, as well as personal data and sibling data from Hanford, have been abstracted and transferred to magnetic tape in suitable format. NSA

N70-29792*# Techtran Corp., Glen Burnie, Md.
CHANGE IN BLOOD CIRCULATION IN THE UPPER EXTREMITY UNDER STATIC LOAD [OB IZMENENII KROVOOBRASHCHENIYA V VERKHNEY KONECHNOSTI PRI STATICHESKOM EE NAPRYAZHENII]
R. L. Timiyevskaya Washington NASA Jun. 1970 13 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (Moscow), v. 50, no. 9, 1964 p 1129 – 1135
(Contract NASw-2037)
(NASA-TT-F-12999) Avail: CFSTI CSCL 06S

In a series of experiments in which plethysmographic measurements were performed on test subjects as they exerted submaximal stress of the forearm by clenching the fist, an increase in the volume of the forearm was noted. Experiments were performed to differentiate muscular contraction from true vascular expansion as causes of the rise in the plethysmographic curves, demonstrating that an increase in vascular cross-section did occur. The stress in the muscles of the forearm hindered circulation to varying degrees in test subjects of varying states of training. After the voluntary static stress, a significant increase in blood flow into the muscles involved was noted. Author

N70-29810*# California Univ., Los Angeles. Center for the Health Sciences.
PHYSIOLOGY OF CHIMPANZEES IN ORBIT Progress Report, Sep. 1969 – Mar. 1970
6 May 1970 13 p
(Contract NSR-05-007-158)
(NASA-CR-110349; POCO-PMH-70-014) Avail: CFSTI CSCL 06P

Progress is reported on the circadian rhythms and biochemical analyses of urinary excretion in unrestrained chimpanzees; a 30-day isolation study of a chimpanzee in simulated flight; an implantable telemetry system; behaviorial trainers; and the test chamber used in the 30-day isolation. R.B.

N70-29900# Joint Publications Research Service, Washington, D.C.
FUNCTIONAL DISORDERS IN HUMANS DURING HYPOKINESIS
L. I. Kakurin et al 26 May 1970 10 p refs Transl. into ENGLISH from Vop. Kurortol., Fizioter. Lech. Fiz. Kul't. (USSR), no. 1, 1970 p 19 – 24
(JPRS-50595) Avail: CFSTI

Restriction of muscular activity and the characteristic redistribution of blood due to the change in hydrostatic pressure during bed rest were studied. The effects of these factors were compared by having one test group remain in a horizontal position for 62 days with minimum motor activity, while another group performed physical exercises every day. The tests show that functional disorders caused by hypokinesis are not fully eliminated by physical exercise, but physical conditioning does reduce the effects of prolonged bed rest. R.B.

N70-29910*# Naval Aerospace Medical Inst., Pensacola, Fla. Bureau of Medicine and Surgery.
THE EFFECT OF GRAVITOINERTIAL FORCE UPON OCULAR COUNTERROLLING
Earl F. Miller, II and Ashton Graybiel 23 Mar. 1970 13 p refs
(NASA Order T-81633; NASA Order R-93)
(NASA-CR-110340; NAMI-1104) Avail: CFSTI CSCL 06S

Normal subjects and persons with severe or complete loss of otolith function in the amount of ocular counterroll associated with several tilt angles as a function of g-loading were studied. A group of six normal subjects manifested a compensatory eye roll which increased as a direct and essentially linear function of the component of the gravitoinertial force acting laterally upon the subject. This increase in response was not observed in five deaf subjects with severe or complete bilateral loss of their vestibular organs. The findings confirm similar results found by other authors using other measuring techniques which show that the reflex eye movement is dependent upon and limited to the magnitude of the gravitoinertial stimulus when the otolithoocular system is functioning normally. However, when this function is impaired or lost, the magnitude of the compensatory eye roll is limited to that manifested at 1 g and possibly to nonotolithic contributions. The findings offer means for differentiation between otolithic defective individuals and normal persons who exhibit little counterrolling. Author

N70-29982*# Aztec School of Languages, Inc., Maynard, Mass.
DEVELOPMENT OF RECEPTOR STRUCTURES IN THE INNER EAR OF VERTEBRATES
L. K. Titova Washington NASA May 1970 276 p refs Transl. into ENGLISH of the book "Razvitiye Retseptornykh Struktur Vnutrennogo Ukha Pozvonochnykh" Leningrad, Nauka Press, 1968
(Contract NASw-1692)
(NASA-TT-F-615) Avail: CFSTI CSCL 06P

Unpublished data on the embryonal development of receptor structures of the vestibular apparatus and of the Corti organ (the organ of hearing), obtained by application of an original method of isolation of a developing inner ear in representatives of five classes of vertebrates, are considered. The morphological and cytochemical changes which originate in the process of differentiation of the receptor structures of the inner ear (the vestibular portion of the labyrinth in the higher and lower vertebrates, the organ of hearing in birds and mammals) are compared. In a sufficiently complete literary survey, data on the morphological, submicroscopic, and cytochemical construction of the receptor structures of the inner ear of mammals and their change with adequate influences are selected. The nature of the chemical and ultrastructural changes in the process of differentiation of the organ and its definitive function is analyzed. Author

N70-29991*# Miami Univ., Coral Gables, Fla. Center for Theoretical Studies.
TOLERANCE SPACES AND BEHAVIOR
Mario Dal Cin Feb. 1970 20 p refs
(Grants NGL-10-007-010; AF-AFOSR-1268-67)
(NASA-CR-110348; CTS-B-70-1) Avail: CFSTI CSCL 05J

Certain events of human behavior are confronted with mathematical objects in order to reach a better understanding of such behavior. In this approach the concept of tolerance is made central and connected with various kinds of inactivity such as rest, inhibition or repression as well as with arousal of conflict situations. Author

N70-29995*# California Univ., Los Angeles. Space Biology Lab.
THE SLEEP CYCLE AND SUBCORTICAL-CORTICAL EEG RELATIONS IN THE UNRESTRAINED CHIMPANZEE
James J. Mc New, R. C. Howe, and W. Ross Adey [1969] 38 p refs
(Contract NSR-05-007-158)
(NASA-CR-110351) Avail: CFSTI CSCL 06P

The sleep cycle and subcortical-cortical EEG relationships were studied in the unrestrained chimpanzee. Sleep was recorded for 7 consecutive nights from each of 3 chimpanzees via biotelemetry techniques. The animals averaged 6.5% of their total nocturnal sleep time in Light Sleep (LS), 53.9% in Medium Sleep (MS), 20.3% in Deep Sleep (DS) and 19.3% in rapid eye movement sleep (REM). The mean duration of the chimpanzees' sleep cycle was 86 min. A first night effect was evidenced by a lower percentage of rem, a higher percentage of light sleep, more time spent in the awake stage, and longer latencies to the onset of both deep sleep and REM. Computer analysis techniques were used in the description of the physical parameters of the EEG to investigate subcortical-cortical relationships during the various stages of the sleep cycle. The unrestrained chimpanzee's sleep cycle as well as his subcortical-cortical EEG patterns were found to compare closely with that for man. Author

N70-30005# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
DETERMINATION OF THE LIGHT-SCATTERING PROPERTIES OF RIBOSOMAL PARTICLES [DETERMINAZIONE DELLA PROPRIETA DI DIFFUSIONE DELLA LUCE DELLE PARTICELLE RIBOSOMICHE]
A. Reale Scafati, M. R. Stornaiuolo, and P. Novaro 15 Jul. 1969 54 p refs In ITALIAN; ENGLISH summary
(ISS-69/29) Avail: CFSTI

The light scattering method has been used on 30S-50S-70S ribosomes from Escherichia coli cells, selected and purified by several methods and analyzed by analytical ultracentrifuge. The purpose of this work was to determinate the molecular weight, the size, and the possibility of interaction of the ribosomes particles in solution, i.e. in the same hydrated state as in actual cells. This information has been obtained extrapolating the data both to a zero angle and to infinite dilution, according to Zimm. The results obtained on the chosen conditions are the following: 30 S M = 1.03 million; 50S M = 1.7 million; 70S M = 2.93 million. Author

N70-30054# Federal Aviation Administration, Washington, D.C.
TIME-ZONE EFFECTS ON THE LONG DISTANCE AIR TRAVELER
P. V. Siegel, Siegfried J. Gerathewohl, and Stanley R. Mohler Sep. 1969 13 p refs
(FAA-AM-69-17) Avail: Issuing Activity

Findings are presented on the consequences of rapidly crossing numerous time zones, such as occurs in present-day jet aircraft travel. Conclusions reached by FAA researchers and scientists of other laboratories are included, together with recommendations for overcoming time-zone fatigue. These recommendations are for use by the individual long distance traveler. A practical formula is given which describes how one may compute the rest period following a long distance trip. This period is to enable the biological rhythms to rephase in order that the traveler will be in proper physical and mental condition to pursue his responsibilities. Author

N70-30057# Yale Univ., New Haven, Conn. School of Medicine.
MULTI-CHANNEL TRANSDERMAL STIMULATION OF THE BRAIN Final Report, 1 Jul. 1967 – 31 Dec. 1969
Jose M. R. Delgado Holloman AFB, N.Mex. 6571st Aeromed. Res. Lab. Feb. 1970 29 p refs
(Contract F29600-67-C-0058)
(AD-702525; ARL-TR-70-1) Avail: CFSTI CSCL 6/16

A system was developed for multichannel electrical stimulation of the brain through the intact skin. The stimulator which is implanted subcutaneously, has no batteries and may be used for the lifetime of the experimental subject. Power and information are provided by a small pack carried externally and activated by radio (100 MHz). A combination pulse width and frequency modulation technique is employed to encode the signal information. Three channels are available and in each, repetition rate, pulse durations, and intensity are remotely controlled, allowing the adjustment of parameters of brain stimulation in completely unrestricted subjects. Author (TAB)

N70-30077*# Department of Health, Education, and Welfare, Phoenix, Ariz. Applied Microbiology and Planetary Quarantine Section.
[MICROORGANISMS DETECTED ON APOLLO SPACECRAFT] Technical Report, Jan. – Mar. 1970
Martin S. Favero Apr. 1970 18 p refs
(NASA Order W-13062)
(NASA-CR-110410; Rept-29) Avail: CFSTI CSCL 06M

A cooperative study is described to determine the effect of test systems and personnel on dilution values at 125 C for two spore crops of Bacillus subtilis var. niger. The three phases of the study at two different sites are compared, and it is concluded that although one method of analysis is more consistent, the same general trends and conclusions do not vary. R.B.

N70-30192*# Department of Health, Education, and Welfare, Phoenix, Ariz. Applied Microbiology and Planetary Quarantine Section.

EVALUATION OF A VERTICAL LAMINAR FLOW BIOLOGICAL SAFETY CABINET

Norman J. Petersen Jun. 1970 52 p
(NASA Order W-13062)
(NASA-CR-110404) Avail: CFSTI CSCL 06L

A commercially available vertical laminar flow biological safety cabinet was subjected to a variety of tests to determine the degree of product and personnel protection provided under conditions of microbiological challenge. Directional and non-directional aerosols of Serratia marcescens were used to simulate sources of microbial contamination. Settling plates, Reyniers slit samplers, and sieve samplers were used to detect the presence of contamination. Common laboratory practices were used to create conditions that might make the cabinet fail. Results demonstrate that failures in both product and personnel protection can be induced. However, the degree of protection provided by the cabinet is consistently high for both product and personnel. In a direct comparison of personnel protection with a conventional biological safety cabinet the laminar flow unit is consistently equal or superior. Author

N70-30213# Joint Publications Research Service, Washington, D.C.

TRANSLATIONS ON EASTERN EUROPE SCIENTIFIC AFFAIRS, NO. 114

26 May 1970 31 p refs Transl. into ENGLISH from various eastern European publications
(JPRS-50589) Avail: CFSTI

Summaries are given for programs in medical cooperation, veterinary research, cancer detection tests, reporting of diarrhea illnesses, production and application of radioactive isotopes, and application of digital computers. R.B.

N70-30245# California Univ., Berkeley. Lawrence Radiation Lab.

PHYSICAL PROBES OF NERVE MEMBRANE STRUCTURE

Gerald Entine (Ph.D. Thesis) Dec. 1969 125 p refs
(Contract W-7405-eng-48)
(UCRL-19334) Avail: CFSTI

The properties of the nerve axon membrane are studied. The source of the nerve axon's uniqueness in its membrane, a layer only about 100 A thick, which is the only part of the axon which changes significantly during the action potential. The composition, structure and mechanism of the membrane is virtually a complete mystery, and it is to these three questions that this research was directed. The major difficulty in this problem is that the 100 A membrane cannot be isolated from the surrounding cell structures which together are one hundred times thicker than the membrane. The fact that during the action potential only the membrane changes significantly was used to distinguish it from the bulk of the cellular structure. Two techniques were developed, one using optical methods and one using electron spin resonance. Both of these techniques have the possibility of being specific enough to indicate directly the composition, structure and mechanism of at least some of the active parts of the membrane. Author

N70-30266# School of Aerospace Medicine, Brooks AFB, Tex. Neuropsychiatry Branch.

THE PHYSIOLOGIC/PSYCHOLOGIC RELATIONSHIP: SOME EXPERIENCES DURING EXPERIMENTS IN A MEDICAL RESEARCH INSTITUTION

Bryce O. Hartman Nov. 1969 41 p refs
(AD-702098; SAM-TR-69-80; SAM-Review-8-69) Avail: CFSTI CSCL 5/10

Fifteen studies conducted at the USAFSAM on environmental stress are reviewed for information regarding the relationships between physiologic and psychologic stress effects. In most studies, there did not seem to be a direct correspondence. Tolerable stress levels may have been the primary factor in this finding. Author (TAB)

N70-30293# Sassari Univ. (Italy). Inst. of Biological Chemistry and General Pathology.

IDENTIFICATION OF PHOTODYNAMIC SYSTEMS IN THE RETINA Final Scientific Report, 1 Oct. 1968 - 30 Jun. 1969

Leonida Santamaria 30 Jun. 1969 12 p refs
(Contract F61052-68-C-0073)
(AD-702470; AFOSR-70-0784TR) Avail: CFSTI CSCL 6/5

The retina lesions caused by light (so called solar retinitis) is not related to a heat effect due either to the collimation of infra-red rays or to the transformation in heat of visible light by absorption from the pigment layer. Our data on isolated calf retina demonstrated for the first time that light produces an oxygen dependent damage of the retina respiratory enzymes. The present final scientific report refers to the demonstration that: (a) the reciprocity law $i \times t = k$ (i is the intensity of light, and t is the exposure time) holds for the photodynamic sensitivity of the retina; (b) the threshold dosage of such a sensitivity is about 200,000 erg/(sq cm) for isolated bovine retina; (c) the chromophores active in producing the damage are in the range of 320-380 nm and 380-500 nm. Author (TAB)

N70-30294# Northrop Corporate Labs., Hawthorne, Calif. Medical Systems Lab.

DETECTION OF BIOLOGIC CHANGES IN ANIMALS EXPOSED TO LOW LEVELS OF IONIZING RADIATION Final Report, Jan. - Dec. 1968

Frank M. Maciasr and Jack M. Beattie Brooks AFB, Tex. AF School of Aerospace Med. Nov. 1969 25 p refs Submitted for publication
(Contract F41609-68-C-0014)
(AD-700724; NCL-69-5R; SAM-TR-69-41) Avail: CFSTI CSCL 6/18

Urinary excretion of fluorescent products was investigated in Macaca mulatta exposed to whole-body, single dose cobalt-60 gamma irradiation of 28, 53, and 106 rads. Ion-exchange and gel-filtration chromatography were used to fractionate and quantitate radiation-responsive urinary products. Radiation dose response relationships were measurable in one major fluorescent fraction within 72 hours postirradiation at all dose levels. A radiation response relationship was measurable within 6 hours at the 106-rad level. The radiation responsive fluorescent subfraction appears to be predominantly composed of large molecular weight (700 to 1,500) acidic heterocyclic amines. The major source of deviation from linearity of response to dose arose from the large variation in the volume of urine excreted by the monkeys. Much greater and earlier correlation between the low irradiation doses and the level of excretory products could probably be obtained by controlling the water intake of the animals. Author (TAB)

N70-30304# Union Carbide Corp., Oak Ridge, Tenn. Computing Technology Center.

AN INVESTIGATION OF THE USE OF A DIGITAL COMPUTER FOR PROCESSING RADIOISOTOPE SCAN DATA

W. J. McClain (Ph.D. Thesis—Tennessee Univ.) 27 Mar. 1970 209 p refs
(Contract W-7405-eng-26)
(CTC-26) Avail: CFSTI

Radioisotope scanning is a very useful diagnostic procedure in the field of nuclear medicine. Activity maps, displayed as two-dimensional plots with varying intensities, provide a means by which clinicians can detect abnormal or malfunctioning tissue in vital organs. Two major factors limit the detectability of tumors in a scan display: (1) the response of the imaging system and (2) the statistical variations in the detected counts. The objective of this study was to determine the effectiveness of a digital computer in overcoming these limitations. The investigation included the development of the hardware and software required for on-line computer operation. The theoretical background and results of the use of six algorithms are included. Common data obtained from a scan of the standard IAEA phantom having a fifty-percent tumor-to-background contrast were used. The data were displayed on a laboratory cathode-ray oscilloscope to provide a comparison of the detectability of tumors in the processed data. Author (NSA)

N70-30322# Atomic Energy Commission, Washington, D.C.
RADIOBIOLOGY [RADIOBIOLOGIYA]
[1969] 209 p refs Transl. into ENGLISH from Radiobiol. (Moscow), v. 9, no. 5, 1969 p 659-792 Prepared by JPRS
(AEC-tr-7136) Avail: CFSTI

Papers within the scope of NSA from the original language journal are presented. NSA

N70-30323# Atomic Energy Commission, Washington, D.C.
RADIOBIOLOGY [RADIOBIOLOGIYA]
[1969] 261 p refs Transl. into ENGLISH from Radiobiol. (Moscow), v. 9, no. 4, 1969 p 483-652 Prepared by JPRS
(AEC-tr-7109) Avail: CFSTI

Papers within the scope of NSA from the original language journal are presented. NSA

N70-30420# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
MORPHOLOGY AND STRUCTURE OF CRYSTALLITES IN BONE
D. Steve Bocciarelli 12 Mar. 1969 26 p refs
(ISS-69/15) Avail: CFSTI

Morphological data and electron diffraction patterns of microcrystals in bone, as compared with those obtained from synthetic crystalline apatites, show that at least a large percentage of the crystal phase in bone must be identified with octacalcium phosphate. In agreement with this result is the fact that stereoscopic views demonstrate that the well-known needle-like microcrystals in bone are actually edge views of platelets. Author

N70-30464 National Lending Library for Science and Technology, Boston Spa (England).
AETIOLOGY OF ULTRA-HIGH FREQUENCY EXPOSURE
I. R. Petrov 27 Feb. 1970 7 p refs Transl. into ENGLISH from Voenno-Med. Zh. (Moscow), no. 5, 1968 p 21-24
(NLL-Trans-2629-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

The combined effects of microwave radiation and rarefied atmosphere at high-altitude radar stations was investigated. The experiments show a decrease in some important immunization reactions when the human body is exposed to decimeter radiation and breathes air with 11.2% oxygen content. In particular, there is a reduction in the number of erythrocytes in the blood, and their number increases only slightly after continued breathing of the rarified air. Persons who are acclimatized over a period of 10 consecutive days prior to being subjected to microwave radiation show no significant changes in immunization reactions. R.B.

N70-30530# National Lending Library for Science and Technology, Boston Spa (England).
CHANGE IN THE THRESHOLD OF ACCELERATION SENSITIVITY UNDER CONDITIONS OF TRANSITORY WEIGHTLESSNESS [OBIZMENENII POROGOV AKTSELERATSIONNOI CHUVSTVITELNOSTI V USLOVIYAKH KRATKOVREMENNOI NEVESOMOSTI]
K. L. Khilov et al Feb. 1970 5 p refs Transl. into ENGLISH from Voenno-Med. Zh. (Moscow), no. 8, 1966 p 60-62
(NLL-RTS-5632) Avail: Natl. Lending Library, Boston Spa, Engl.: 7s 6d or 1 NLL photocopy coupon

Tests were made during horizontal and weightlessness flights to determine the trend of threshold changes of acceleration sensitivity. The subjects sat in the Baranyi chair, and were turned from 180 deg in 20 sec to 360 deg in 15 sec. It was found that in all subjects a change of the sensitivity threshold of horizontal semicircular canals to angular acceleration under conditions of dynamic weightlessness was established. In a few subjects the sensation in weightlessness was absent. In the remaining subjects the onset of the sensation of rotation under weightlessness was retarded by 3-11 sec. It is felt that the feeling of loss of weight in otolith causes a decrease of the activating effect of the otolith receptor upon the sensory reactions from the semicircular canals. This causes an increase in the sensitivity thresholds in the horizontal semicircular canals in a state of dynamic weightlessness. N.E.N.

N70-30561# Fraunhofer-Gesellschaft zur Forderung der Angewandten Forschung E. V., Munich (West Germany). Inst. fuer Hygienisch-Bakteriologische Arbeitsverfahren.
OLD GOALS, NEW METHODS: APPLIED HYGIENE, A PART OF MODERN RESEARCH [ALTE ZIELE, NEUE WEGE: ANGEWANDTE HYGIENE, EIN BESTANDTEIL MODERNER FORSCHUNGSRICHTUNG]
E. Kanz *In its* Examples of Appl. Res. Jun. 1969 p 64-67 In GERMAN (See N70-30551 15-34)
Avail: CFSTI

Two important criteria are cited for modern hygiene as an applied science: (1) The reduction in the degree of probability of an infection is the measure of hygienic success, and (2) The knowledge of hygiene research must be properly applied to humans in the correct form, in the proper measure, and at the right time. ESRO

N70-30563# Technische Hochschule Munchen (West Germany). Inst. fuer Nachrichtentechnik.
MAN AS AN INFORMATION STORE AND SOURCE [DER MENSCH ALS INFORMATIONSSPEICHER UND INFORMATIONSQUELLE]
H. Marko *In* Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 73-81 refs In GERMAN Sponsored partly by Fraunhofer Ges. (See N70-30551 15-34)
Avail: CFSTI

Human beings as information stores are treated from the viewpoint of the communications engineer, and with experimental results from other disciplines are used in an integrated cybernetic concept. The investigation was restricted to memory in its narrowest sense, including the processes of information acquisition, transmission, and generation, but excluded phylogenetic memory. ESRO

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N70-29217# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
AEROSOL BEHAVIOR IN HIGH PRESSURE ENVIRONMENTS: SECOND ANNUAL REPORT Final Scientific Report, 1 Mar. 1969 - 28 Feb. 1970
Robert A. Gussman and Anthony M. Sacco 28 Feb. 1970 38 p refs
(Contract N00014-69-C-0228)
(AD-700929; Rept-1894; AR-2) Avail: CFSTI CSCL 6/11

The second year of a study has been completed whose main purpose is to elucidate hazards to personnel arising from aerosols in high pressure helium-oxygen atmospheres. The years efforts included: experimental studies on the generation of aerosols in the high pressure environment, pulmonary deposition modeling, theoretical filter efficiency calculations, and the construction of a high pressure filtration efficiency test apparatus. The first two topics listed are described separately in a previous special report, AD-683 794. Author (TAB)

N70-29304*# Exotech, Inc., Washington, D.C.

POTENTIAL EFFECTS OF RECENT FINDINGS ON SPACECRAFT STERILIZATION REQUIREMENTS, APPENDIX A

S. Schalkowsky, L. B. Hall (NASA, Washington, D.C.), and R. C. Kline *In its* Anal. Tech. in Planetary Quarantine May 1970 18 p refs (See N70-29302 15-04)
(Contracts NASw-1558; NASw-1666)
Avail: CFSTI CSCL 06M

An important task related to the formulation of planetary quarantine standards is the achievement of an acceptable compromise between (1) the prevention of planetary contamination and (2) the impact of quarantine requirements on the conduct of planetary missions. An analytical framework is provided for the assessment of data which has become available during the past year or which is currently being evolved. In particular, an evaluation is made of the probability of release of viable organisms from the spacecraft as a function of: (1) impact velocity magnitudes and the probability of their occurrence; (2) the degree of equipment fracturing at impact velocities; and (3) the number of viable organisms in spacecraft materials. Work being done to quantify each of three types of contamination, i.e. that on open surfaces, mated surfaces and buried contamination, is described in the context of seeking an approach to spacecraft sterilization that would be most compatible with the implementation of planetary missions. It is concluded that the results of work now in progress may lead to less severe dry-heat sterilization of planetary spacecraft than had been considered necessary in the past. Author

N70-29306*# Exotech, Inc., Washington, D.C. Systems Research Div.

AN ANALYTICAL BASIS FOR ASSAYING BURIED BIOLOGICAL CONTAMINATION, APPENDIX C

Robert C. Kline and Phillip L. Randolph *In its* Anal. Tech. in Planetary Quarantine May 1970 30 p refs (See N70-29302 15-04)
(TRSR-036) Avail: CFSTI CSCL 06M

An analysis of a procedure for assaying biological contamination buried or embedded in spacecraft materials is presented. The procedure requires the controlled fracture of representative samples of a material whose buried loading is of interest. Each sample is tested for biological contamination on the totality of surfaces exposed as a result of the fracturing process. The basic datum or observation consists of the proportion of samples which yield contamination upon culturing. Conventional statistical techniques, combined with an assumed relation between the mean concentration of organisms buried within the material and the observed datum, produce an upper bound estimate for the unknown mean concentration, expressed to any prescribed level of confidence. In principle, the conservativeness of the resulting estimate is directly related to the sample size and the amount of surface area exposed by fracture; as the sample size and/or exposed area increase(s) the difference between the estimate and the unknown mean load tends to decrease. Author

N70-29325# Los Alamos Scientific Lab., N. Mex.

HEALTH AND SAFETY MANUAL OF THE ANALYTICAL CHEMISTRY GROUP

William H. Ashley, Arthur L. Henicksman, Al Zerwekh, and Charles F. Metz Aug. 1969 30 p refs
(Contract W-7405-eng-36)
(LA-4092) Avail: CFSTI

Topics covered include: emergency action, heart-lung resuscitation, general safety, safety in handling hazardous materials, shop safety, electrical safety, fire safety, and safety in handling fissionable materials. NSA

N70-29540# School of Aerospace Medicine, Brooks AFB, Tex.

NEPTUNE: A MULTIELEMENT TASK SYSTEM FOR EVALUATING HUMAN PERFORMANCE Final Report, May 1963 – May 1968

Richard E. Mc Kenzie, Doyle D. White, and Bryce O. Hartman Oct. 1969 73 p refs
(AD-700313; SAM-TR-69-25) Avail: CFSTI CSCL 5/10

A multielement psychomotor test device called Neptune (for neuropsychiatric test unit) was devised to study the airmans behavior as systems operator as well as pilot. Two Neptune configurations have been developed: the Mark 1, which incorporates the functions of vigilance, arithmetic and encoding, compensatory tracking, visual monitoring with short-term memory, and problem-solving; and the Mark 2 which contains the same tasks and, in addition, an auditory monitoring task. Task descriptions, circuit design and operation, parts lists, illustrative data from subjects participating in test standardization studies, and illustrative experimental data are provided. In addition to measuring human performance, the system has the capability for inducing a unique task-stress factor. Author (TAB)

N70-29619# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.

SEVERAL MAN/MACHINE CONSIDERATIONS FOR HELICOPTERS

D. E. Cooper and L. S. Szustak *In* AGARD Probl. of the Cockpit Environment Mar. 1970 24 p refs (See N70-29618 15-02)
Avail: CFSTI

The helicopter, by the nature of its versatility, is assuming a greater role in a wide range of new and demanding tasks. This expanded usage requires that special considerations be given to practically all aspects of the man/machine relationship. The pilot must control his helicopter's six degrees-of-freedom by using four modes of control. Further, the pilot receives a variety of visual, motion, and force cues which, if properly presented and used, can increase the ease of the piloting task. Recent theoretical work and flight test experience on several Sikorsky helicopters in the areas of flying and handling qualities have produced a number of significant factors relating to the man/machine interface. Author

N70-29620# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.

TRACKING A DISPLAY APPARENTLY VIBRATING AT 1-10 Hz

H. F. Huddleston *In* AGARD Probl. of the Cockpit Environment Mar. 1970 10 p refs (See N70-29618 15-02)
Avail: CFSTI

Thirty-six subjects tracked a 2-element visual display which was viewed through a mirror system arranged to impose apparent vertical vibration on the display. The frequency range 1-10 Hz was explored at double amplitudes of 2 deg, 4 deg and 8 deg vibration. A significant decrement in performance which was frequency-dependent and which was most marked over the range 2-5 Hz was noted. The higher vibration amplitudes were more harmful over the range 1-3 Hz, where subjects said they attempted to follow the display oscillation with their eyes, and were most helpful over the range 5-10 Hz, where a flickering nodal image of the display can be usefully fixated (at top and bottom of the vibration excursion). These findings relate to information on the breakdown of the eye pursuit system from 1-4 Hz. Data from EOG studies are presented to show how the eye decreases its pursuit amplitude and lags in phase, progressively, as frequency increases. This pursuit fails whether the target is a large retinal image eliciting the reflexive action of a presumed mid-brain center or whether subjects consciously try to follow a small target against a visible static surround. Finally, it is clear that performance on a display element requiring visual discrimination (of a vernier acuity type) along the direction of display vibration will be significantly more impaired than on that requiring discrimination across the direction of vibration. Author

N70-29621# Royal Aircraft Establishment, Farnborough (England).

OPTIMISATION OF THE COCKPIT ENVIRONMENT AND THE CREW-COCKPIT INTERFACE

G. R. Allen and J. M. Shaw *In* AGARD Probl. of the Cockpit Environment Mar. 1970 13 p refs (See N70-29618 15-02)
Avail: CFSTI

An engineer's approach to the optimization of the cockpit environment and the crew cockpit interface is presented. The position in the human engineering field is compared with that existing in other branches of aircraft engineering where optimization in terms of mechanical performance and cost is relatively successful. Optimization in terms of effectiveness is less successful because in part it involves the performance of the man. Three aspects of the overall problem are discussed to illustrate the type of information required by the engineer and how it can be obtained. Author

N70-29622# Jan Swammerdam Inst., Amsterdam (Netherlands). Lab. of Ergonomic Psychology.

OBJECTIVE MEASUREMENT OF MENTAL WORKLOAD: POSSIBLE APPLICATIONS TO THE FLIGHT TASK

J. W. H. Kalsbeek *In* AGARD Probl. of the Cockpit Environment Mar. 1970 7 p refs (See N70-29618 15-02)
Avail: CFSTI

Some methods and techniques are developed and applied in simulation experiments in order to evaluate cockpit workload. Heart beat irregularity patterns are scored as a function of the number of signals per minute answered by six subjects in a laboratory test situation. Distraction stress is evaluated in relation to the step-by-step disintegration of writing performance. A description is given of the mental task simulator which is applied to cockpit design. J.M.C.

N70-29626# Entwicklungsring Sud, Munich (West Germany).

INVESTIGATIONS OF THE TERM "REMNANT SPECTRUM" OF THE HUMAN CONTROL OUTPUT FUNCTION

Ruediger Seifert and Udo Miller *In* AGARD Probl. of the Cockpit Environment Mar. 1970 8 p refs (See N70-29618 15-02)
Avail: CFSTI

A survey of the experimental approach to find criteria to assess man's performance in a given system, and on the other hand to find methods to define the task load, and therewith the difficulty of a system, without applying known descriptive models, is given. The rationale of the approach is to investigate manual tracking control systems, while applying mathematically defined varied input forcing functions. Author

N70-29627# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

A CONSIDERATION OF THE INFLUENCE OF INFORMATION TRANSMISSION ON THE EVALUATION OF DISPLAY SYSTEMS

G. Schweizer *In* AGARD Probl. of the Cockpit Environment Mar. 1970 9 p (See N70-29618 15-02)
Avail: CFSTI

The evaluation of display systems meets difficulties because there is no certainty what criterion the man uses to optimize his performance. If one considers the man-machine system as a communication channel, measurements of the rate of the transmission of the information by the system may result in data that correlates with subjective evaluations. If there is any mismatching between the components of the display system, the transmission of the information will be reduced. Some basic problems of information theory are explained, and its use to assess the human performance in instrument monitoring tasks. Results of various simulator studies with integrated electronics displays are shown. Our experience is that this approach to assess the performance of the human monitor has benefits and potentials. The experiments indicate that the results are useful in designing integrated displays. Author

N70-29629# Litton Systems, Inc., Woodland Hills, Calif.

THE COCKPIT AS A "BRAIN CENTER" TRADE-OFF

Raymond E. Bernberg *In* AGARD Probl. of the Cockpit Environment Mar. 1970 16 p refs (See N70-29618 15-02)
Avail: CFSTI

A discussion of the problems concerned with target detection and acquisition is presented. The discussion analyzes the human operator and his information input and storage capabilities. A model of the human process is made with computing system elements. This serves as a basis for a trade-off comparison between human and computer systems; the philosophy behind these considerations is the concept of unburdening the pilot and copilot and providing a man/machine balance which is most effective at a given technological time frame. The results of the trade-off indicate that man does not execute brain type operations with a wide bandwidth as does modern computer technology. However, man does have an immense mass and associative memory storage function which is well beyond the technology of computing elements in the near future. An approach to a possible effective balance for this problem is suggested. Author

N70-29630# British Aircraft Corp., Preston (England).

CREW WORKLOAD SHARING ASSESSMENT IN ALL-WEATHER, LOW-LEVEL STRIKE AIRCRAFT

Alan F. Daniels *In* AGARD Probl. of the Cockpit Environment Mar. 1970 11 p (See N70-29618 15-02)
Avail: CFSTI

The first phase of an experimental program undertaken to investigate various aspects of crew workload and workspace assessment is described. In particular, the use of time-lapse filming techniques to assist in the evaluation of workspace utilization is detailed. The results obtained and the limitations encountered during a relatively inexpensive study in the early feasibility stages of an aircraft program are discussed. Author

N70-29632# Boeing Co., Seattle, Wash.

A DEVELOPMENT IN COCKPIT GEOMETRY EVALUATION

Leo F. Hickey, Wayne E. Springer, and Fracis L. Cundari (ONR, Washington, D.C.) *In* AGARD Probl. of the Cockpit Environment Mar. 1970 27 p refs (See N70-29618 15-02)
(Contract N00014-68-C-0289)
Avail: CFSTI

The overall problem of cockpit evaluation is discussed. Within this context, the specific problem of cockpit geometry evaluation is explored. Known methods for evaluating geometry (the physical layout of the entire cockpit complex - displays, controls, seats, personal equipment, windshield/canopy, interior surface shape, openings for ingress and egress) are summarized. Their advantages and disadvantages are presented. The application of modeling techniques that take advantage of computer capability to improve geometry evaluation is discussed. A research program, in progress, directed toward the full development of a computerized model of the physical aspects of flight crewmen and any cockpit configuration is presented in some detail. Author

N70-29633# Army Natick Labs., Mass. Pioneering Research Lab.

THE UTILIZATION OF MILITARY ANTHROPOMETRY FOR AIRCRAFT COCKPIT DESIGN

Robert M. White *In* AGARD Probl. of the Cockpit Environment Mar. 1970 11 p refs (See N70-29618 15-02)
Avail: CFSTI

Since anthropometric data constitute a basic requisite for defining the elements of body size in the human engineering of man/equipment systems, anthropometry represents an essential input to the development of such systems in order to achieve compatibility between the man and his equipment. The analysis and evaluation of anthropometric data are discussed, with reference to newly available data on the US military population. The US data indicate distinct differences in body size between flying and non-flying military personnel, primarily due to a marked difference in age. Finally, some general observations are made regarding the applications of anthropometric data in aircraft cockpit design. Author

N70-29634# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

GROUND AREAS VISIBLE FROM THE AIRCRAFT COCKPIT EYE POSITION: A METHOD OF EVALUATION

K. W. Kennedy *In* AGARD Probl. of the Cockpit Environment Mar. 1970 11 p (See N70-29618 15-02)
Avail: CFSTI

A method for evaluating and comparing aircraft in terms of the ground areas visible from their cockpits and demonstrate its use on two aircraft is described. Emphasis is placed on the visual reconnaissance activity. The method of evaluating vision toward the ground consists of calculating the areas of selected sectors of the surface of the earth which are visible from the cockpit eye position. Author

N70-29635# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.

PILOTS' ASSESSMENT OF THEIR COCKPIT ENVIRONMENT

J. F. Murrell *In* AGARD Probl. of the Cockpit Environment Mar. 1970 8 p refs (See N70-29618 15-02)
Avail: CFSTI

Assessment by the user pilot is an important source of information as to the efficiency of aircraft display and control systems. Much information can be gained and reduced to quantitative form by use of open-ended questions. In the study reported, 229 civilian airline pilots representing nine different aircraft types, responded to five open-ended questions about design and layout of their cockpit. Pilots flying different types of aircraft agreed in the frequency of their comments and criticisms. They most often criticized their radio and navigation aids. Application of these results is discussed. Author

N70-29660# Factory Mutual Research Corp., Norwood, Mass.

AN ENGINEERING STUDY OF FIRE PROTECTION RESEARCH Final Report

Myron J. Miller and John Andrias Jun. 1969 114 p refs
(Contracts N00025-68-C-0026; NBy-88566)
(AD-700337; FMRC-18733) Avail: CFSTI CSCL 13/12

The purpose of the study was to assess available fire research information, review current efforts in fire research, and condense the resulting findings into a statement of guidelines for action. The basic emphasis is on the protection required and the protection being provided by the Naval shore establishment. The two primary areas of consideration are the protection of buildings and their contents, and aircraft crash/rescue activities. Author (TAB)

N70-29692# Mitre Corp., Bedford, Mass.

STUDIES OF DISPLAY SYMBOL LEGIBILITY. PART 21: THE RELATIVE LEGIBILITY OF SYMBOLS FORMED FROM MATRICES OF DOTS

Donald A. Shurtleff Feb. 1970 44 p refs
(Contract F19628-68-C-0365)
(AD-702491; MTR-798; ESD-TR-69-432) Avail: CFSTI CSCL 5/5

The purpose of the study was to determine the legibility of symbols formed from matrices which contained different numbers of dot elements. A set of alphanumeric symbols was constructed from each of the following dot matrices: 3 x 5, 5 x 7, 7 x 11, and 9 x 15. The four symbol sets were shown for identification to one group of operators under nearly optimal viewing conditions and to a second group under degraded viewing conditions. Both rate and accuracy of identification were recorded. The results indicate that the 5 x 7 symbols are as legible as 7 x 11 and 9 x 15 symbols for most of the conditions studied, but in one condition the 7 x 11 was more legible than the 5 x 7. Author (TAB)

N70-29769# Joint Publications Research Service, Washington, D.C.

SIGNIFICANCE OF V. N. SAKACHEV'S STUDY ON BIOGEOCENOSIS FOR CREATING CLOSED SYSTEMS

V. P. Dadykin 26 May 1970 15 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 2, 1970 p 229-237
(TPRS-50594) Avail: CFSTI

The applicability of the basic principles of biogeocenosis to the development of artificial closed ecological systems is examined. The special features of creating this type of system and the limitations resulting from the use of artificial systems for supporting human life in space projects are pointed out. Author

N70-29881*# National Aeronautics and Space Administration. Electronics Research Center, Cambridge, Mass.

AN AUTOMATIC CELL COUNTER

Leon Bess Washington Jun. 1970 25 p
(NASA-TN-D-5821; C-121) Avail: CFSTI CSCL 06B

A completely automatic cell counter using analog techniques and standard electronic TV components has been devised and is described here. It promises to perform with a counting error of around + or − 15 percent, and complete its operation in less than 2 minutes. Author

N70-29904*# Systems Technology, Inc., Hawthorne, Calif.

THE MEASUREMENT AND ANALYSIS OF PILOT SCANNING AND CONTROL BEHAVIOR DURING SIMULATED INSTRUMENT APPROACHES

David H. Weir and Richard H. Klein Washington NASA Jun. 1970 122 p refs
(Contract NAS2-3746)
(NASA-CR-1535; TR-170-4) Avail: CFSTI CSCL 05H

Seven subjects flew Category 2-like ILS approaches in a six degree of freedom fixed-base DC-8 simulator. A conventional instrument panel and controls were used, with simulated vertical gust and glide slope beam bend forcing functions. Pilot eye fixations and scan traffic on the panel were measured using a recently developed eye point-of-regard (EPR) system. The EPR data were reduced for 31 approaches with a cross section of subjects to obtain dwell times, look rates, scan rates, and fractional scanning workload. These data are compared with previous experimental results. Simultaneous recordings were made of displayed signals, pilot response, and vehicle motions to permit their correlation with the eye movement results during the next phase of the overall program. The scanning results showed the attitude and glide slope/localizer instruments to be primary in a manual ILS approach, sharing 70 to 80 percent of the pilot's attention. The glide slope/localizer instrument required shorter dwell times with a fixed instrument sensitivity. Differences in dwell time between pilots only occurred on the attitude instrument. Author

N70-29936# Army Behavioral Science Research Lab., Arlington, Va.

SUMMARY OF BESRL SURVEILLANCE RESEARCH

A. H. Birnbaum, Robert Sadacca, R. S. Andrews, and M. A. Narva

Sep. 1969 60 p refs
(AD-701907; BESRL-TRR-1160) Avail: CFSTI CSCL 15/4

The SURVEILLANCE SYSTEMS research program of the U. S. Army Behavioral Science Research Laboratory has as its objective the production of scientific data bearing on the extraction of information from surveillance displays and the efficient storage, retrieval, and transmission of this information within an advanced computerized image interpretation facility. The present technical research report summarizes in integrated fashion the major problem areas, the rationale of BESRLs approach to their solution, and the general course of research studies completed or in progress in the surveillance areas of manned systems experimentation. The research effort is conducted within the following Work Units: (1) Interpreter Techniques--The determination of interpreter techniques in a surveillance facility; (2) Image Interpretation Displays--Influence of displays on image interpreter performance; (3) Intelligence Systems--Intelligence information processing systems; (4) Image Systems--Information processing in advanced image interpretation systems. Studies of the Surveillance Systems research programs conducted by the Support Systems Research Division of BESRL have resulted in findings which are applicable in optimizing human component performance in existing systems and in providing systems developers with information useful in design specifications for future systems. Author (TAB)

N70-30016# Martin Marietta Corp., Orlando, Fla.

TARGET ACQUISITION STUDIES: VISUAL ANGLE REQUIREMENTS FOR DIRECTLY VIEWED TARGETS Final Report, Oct. 1968 - Jan. 1970

James W. Bergert Jan. 1970 69 p refs
(Contract N00014-67-C-0340)
(AD-700328; OR-10399) Avail: CFSTI CSCL 5/5

The study investigated the target acquisition capability of the unaided eye in a simulated real world environment. By investigating the component parts of a target acquisition problem separately, and under their dynamic interactions. It included target search, detection and recognition in an unbriefed target mode and in static and dynamic threshold modes. Author (TAB)

N70-30055# General Electric Co., Schenectady, N.Y. Specialty Materials Handling Products Operation.

HARDIMAN 1 ARM TEST: HARDIMAN 1 PROTOTYPE PROJECT Summary Report

P. F. Croshaw 31 Dec. 1969 76 p
(Contract N00014-66-C-0051)
(AD-701359; S-70-1019) Avail: CFSTI CSCL 6/2

A discussion is presented of the test and evaluation of the Hardiman I left arm assembly. The Hardiman I prototype is powered exoskeletal harness which will amplify mans strength and endurance while retaining his versatility and dexterity. The objective of the arm test was to investigate human factors and servo performance while lifting a load. Author (TAB)

N70-30061# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

AN ALGORITHM FOR DISTINGUISHING UNCENTERED VISUAL FORMS

V. S. Vainshtein 1 Oct. 1969 9 p refs Transl. into ENGLISH from Vses. Inst. Nauchi i Tekhn. Inform. (Moscow), 1967 p 86 - 89
(AD-700388; FTD-HT-23-1425-68) Avail: CFSTI CSCL 6/4

An algorithm based on potential functions for positioning images is proposed. Each point in the n-dimensional space of receptors which appears when the objects are displayed, is considered to be a potential source (its potential has a maximum value and decreases away from this point). The process of teaching a machine to recognize visual images is based on an improved algorithm of potentials where the potentials of the images are computed from a given equation. The block diagram of the algorithm used in conjunction with the BESM-2M computer is presented. TAB

N70-30127*# TRW, Inc., Cleveland, Ohio. Mechanical Products Div.

AIRCREW OXYGEN SYSTEM DEVELOPMENT: WATER ELECTROLYSIS SUBSYSTEM REPORT

A. D. Babinsky and T. P. O'Grady May 1970 169 p
(Contract NAS2-4444)
(NASA-CR-73394; TRW-ER-7256-20) Avail: CFSTI CSCL 06K

Results are presented of a program to develop a closed loop aircrew oxygen system which generates oxygen on-board the aircraft as required. A water electrolysis module is used as the oxygen generator while the amount of oxygen required is decreased significantly under open-loop requirements through the use of a closed loop rebreather subsystem. The Water Electrolysis Module (WEM) was designed as a laboratory type module utilizing air-cooled fins for heat removal and a static water feed system such that the module is capable of operation in all degrees of rotation. The individual cell structural components were machined from extruded polysulfone sheets. Endplates were machined of 3/8 inch thick stainless steel plate. Current collectors were formed by nickel plating copper sheets, followed by drilling and shearing to size after the plating operation. Electrodes, asbestos matrices and plastic screens were hand-cut to size. Module assembly was accomplished by stacking the individual components for ten cells on an assembly fixture. Insulated drawbolts, torqued in a predetermined pattern complete the module assembly. Parametric tests of the module are described and the results are summarized. Author

N70-30188*# Miami Univ., Coral Gables, Fla. Center for Theoretical Studies.

STATISTICAL AND HIERARCHICAL ASPECTS OF BIOLOGICAL ORGANIZATION

Michael Conrad Mar. 1970 56 p refs
(Grant NGL-10-007-010)
(NASA-CR-110357; CTS-B-70-2) Avail: CFSTI CSCL 06D

Biological organization has a compartmental structure. The organization and variability of these compartments, or the degree of differentiation and uncertainty associated with them, are expressed in terms of certain entropy measures. Uncertainty is related to the adaptability of the compartment. The condition for most efficient operation of biological systems is discussed in these terms, as are various processes, such as computation, control, and competition. A principle of static equilibrium is proposed, according to which the uncertainty associated with the system approaches the uncertainty associated with the environment, including other biological systems. This is represented in terms of a vector model of biological organization. The relation only expresses conditions which biological systems tend to fulfill in the course of evolution. However, this makes it useful to treat the uncertainty associated with the biological system as a whole as an approximately conserved quantity. The distribution of variability to different levels of organization is discussed on this basis, and the model is compared to the background of biological fact. Author

N70-30193*# Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.

EXTRAVEHICULAR ATTITUDE CONTROL BY USE OF HEAD MOTIONS

Lonnie Charles Von Renner (M.S. Thesis) Jun. 1970 97 p refs
(Grants NGL-22-009-025; NGR-22-009-312)
(NASA-CR-110353; MVT-70-1) Avail: CFSTI CSCL 05E

On the basis of a survey conducted on existing techniques for astronaut extravehicular attitude control in space, experiments were performed to determine the usefulness of bioelectric currents generated in muscle tissue as a control signal source. Muscle sites were identified on the neck and bio-currents were detected using surface electrodes. Raw signals were generated by turning the head right or left with respect to the body; subsequent conditioning was performed using a hybrid computer. Motion cues (yaw) were provided by a rotating chair which a subject attempted to control by moving his head. Performance levels based upon integrated squared error were compared for two spearate plant dynamics between electromyographic and conventional pencil-stick control. The data revealed that control of yaw attitude using EMG's was a practical means of providing hands-off control. However, EMG performance was in all cases poorer than equivalent tests conducted using a stick. This probably resulted from the large deadband which existed in the physical angle of turn required of the head to produce a measurable signal. Recommendations are made for describing function analysis of the data and the investigation of other mechanical methods for using head position as a control signal source. Author

N70-30194# System Development Corp., Santa Monica, Calif.
THE DEVELOPMENT OF A COMPUTER-DIRECTED TRAINING SUBSYSTEM AND COMPUTER OPERATOR TRAINING MATERIAL FOR THE AIR FORCE PHASE 2 BASE LEVEL SYSTEM Final Report
30 Nov. 1969 298 p
(Contracts F19628-67-C-0427; F19628-68-C-0399)
(AD-702529; ESD-TR-70-27) Avail: CFSTI CSCL 5/9

The report describes a study concerned with the design, development and evaluation of an integrated Computer-Directed Training Subsystem (CDTS) for the Air Force Phase II Base Level System. The development and evaluation of a course to train computer operators of the Air Force Phase II Base Level System under CDTS control is also described. Detailed test results for validation of the computer operator course and Formal Qualification testing of the CDTS are presented. Conclusions and recommendations with respect to the current CDTS recommendations for additional capabilities and further implications are discussed. Author (TAB)

N70-30256# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEMS OF ENGINEERING PSYCHOLOGY (COLLECTION OF ARTICLES)
B. F. Lomova et al May 1968 466 p refs Transl. into ENGLISH from Probl. Inzh. Psikhologii, Materialy Konf. (Leningrad), no. 2, 1965 p 1-319
(AD-684372; FTD-MT-24-228-67) Avail: CFSTI CSCL 5/5

The document contains 28 articles on human performance in mechanical systems. TAB

N70-30257# Air Force Systems Command, Lackland AFB, Tex.
PROCEEDINGS OF THE ANNUAL CONFERENCE (10TH) MILITARY TESTING ASSOCIATION
Oct. 1968 296 p refs Conf. held at San Antonio, 16-20 Sep. 1968
(AD-679145) Avail: CFSTI CSCL 5/9

The papers presented reflect a diversity of concerns and developments in areas related to military testing. Participants included representatives of the military services, governmental agencies, and the civilian community. Author (TAB)

N70-30264# Bunker-Ramo Corp., Canoga Park, Calif. Human Factors Dept.
THE EFFECT OF AMOUNT AND TIMING OF HUMAN RESOURCES DATA ON SUBSYSTEM DESIGN Technical Report, 1 Apr. 1968 - 31 Mar. 1969
David Meister, Dennis J. Sullivan, Dorothy L. Finley, and William B. Askren Oct. 1969 137 p refs
(Contract F33615-68-C-1367)
(AD-699577; AFHRL-TR-69-22) Avail: CFSTI CSCL 5/5

Human resources data HRD inputs supplied during design ofter fail to exercise a significant effect upon that development. It is possible that inputs are both insufficient and presented at incorrect times during development. The study described in the report had two main purposes: to determine whether the amount and timing of HRD influence design and to investigate the effect upon design of different personnel quantity and quality requirements. Author (TAB)

N70-30302# School of Aerospace Medicine, Brooks AFB, Tex.
RECOVERABLE TEMPERATURE-SENSING IMPLANT Final Report, Jun. 1968 - May 1969
Henry Buchanan, Willis F. Moore, and Calvin R. Richter Nov. 1969 12 p refs
(AD-700737; SAM-TR-69-69) Avail: CFSTI CSCL 6/5

A temperature-sensing device suitable for chronic implantation in 3- to 8-kg. animals was designed to be recoverable. The implant case and screw-on cap were machined from Teflon stock, which provides a moisture-impervious seal between case and cap. The configuration of the finished assembly permits the sensor circuitry and battery to slide readily into the case. The screw-on cap permits battery replacement without damaging the case-to-cap seal. The sensor was calibrated over a temperature range of 34 degrees to 42 degrees C. The physical size of implant is contingent on battery size. The devices transmitted primate core temperatures within plus or minus 0.1 degrees C. for periods of from 173 to 204 days. Author (TAB)

N70-30431# Joint Publications Research Service, Washington, D.C.
ECHO LOCATION PROCESS IN OXYGNATHOUS BATS IN FREE FLIGHT
G. N. Simkin 4 Jun. 1970 15 p Transl. into ENGLISH from Biol. Nauki (Moscow), no. 3 (75), 1970 p 61-71
(JPRS-50665) Avail: CFSTI

Certain methods are considered for correlating the parameters of orientation signals with distinctive features of the experimental situation and with characteristics of the target to be located. Main attention is concentrated on regularities in the variation of repetition rate, length of orientation signals and interpulse intervals, as well as on the character of pulse grouping in a train and within the series. Variation in repetition rate is linked with the resolving power of the direction-finding system, and variation in length with the system's operational capabilities. As the most important factor in discovering the laws governing the structural and functional organization of the orientation process, the necessity of making experimental conditions more complex is singled out with enlarging the number of classes of targets to be located. Author

N70-30510*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE EFFECTS OF ALCOHOL ON THREE LEVELS OF COMPLEX HUMAN BEHAVIOR
Grady Vancil Maraman (Ph.D. Thesis—Virginia Commonwealth Univ.) Jun. 1970 99 p refs
(NASA-TM-X-62961) Avail: CFSTI CSCL 06O

Each level of complexity contained an increasing component indicative of cognitive behavior. The motor component of all three levels was maintained approximately constant. The blood alcohol concentrations studied were 0.000, 0.010, 0.050, and 0.100 percent, as determined with the Breathalyzer. Alcohol was administered in the form of 50 percent ethanol mixed with frozen orange juice concentrate. All blood alcohol concentrations were studied in the same subject during one test session. The study was replicated. The study was repeated twice without alcohol. Data are presented which indicate that cognitive processes were not affected by these blood alcohol concentrations. Performance on all three tasks was affected significantly; however, the effect of the alcohol appeared to be on the subject's ability to make precision positioning movements of the limbs. Author

N70-30513# Joint Publications Research Service, Washington, D.C.
STORY OF USSR COSMONAUT TRAINING CENTER

RELATED
I. Kamanin 8 Jun. 1970 9 p Transl. into ENGLISH from Komsomol'skoye Znamya (Kiev). 25 Apr. 1970 p 31
(JPRS-50683) Avail: CFSTI

A journalistic account of the founding and development of the Cosmonaut Training Center is presented. Parachuting and weightlessness training are mentioned. F.O.S.

06 CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N70-29210 Montana State Univ., Missoula.
AN EVALUATION OF THE HYDROGEN-CHLORINE FLAME AS AN EXCITATION SOURCE FOR FLAME PHOTOMETRY
William Kemp Johnston, Jr. (Ph.D. Thesis) 1969 73 p
Avail: Univ. Microfilms: HC $4.00/Microfilm $3.00 Order No. 69-20121

Emission spectra were obtained in the ultraviolet and visible regions of the spectrum, 2500 A to 6500 A, for silver, calcium, cadmium, cobalt, chromium, copper, iron, magnesium, manganese, molybdenum, sodium, nickel, and strontium by aspirating ethanolic solutions of salts of these elements into a hydrogen-chlorine flame. The emission intensities were compared to those obtained in a hydrogen-air flame in order to evaluate the potential of a hydrogen-chlorine excitation source. Of these elements, only silver, copper, and magnesium gave emission intensities comparable to those obtained in the air supported source. Molecular chloride bands were observed in the case of calcium, copper, and magnesium. The copper band was unusually strong compared to emission from this element in the air flame. In addition to the elements already mentioned aluminum, gold, potassium, lithium, and zinc were fed to this unusual flame to determine if they would emit in the halogen atmosphere. Dissert. Abstr.

N70-29223 State Univ. of New York at Buffalo.
STUDIES IN THE POLARIZED SPECTRA AND STRUCTURE OF TRANSITION METAL COMPLEXES IN CRYSTALS
David Alan Langs (Ph.D. Thesis) 1969 258 p
Avail: Univ. Microfilms: HC $11.70/Microfilm $3.35 Order No. 69-20526

A variety of cupric salts were investigated by single crystal X-ray diffraction and spectroscopic techniques. The transitions in the visible region of the spectrum were explained in terms of ligand field theory and the selection rules were derived from the structure and orientation of the cupric chromophore. The assignments of the spectra were confirmed in several cases by molecular orbital calculations. A series of salts containing the Cu(CH3COO)4(2-) ion were shown to have a three-band spectrum which is consistent with the S sub 4 symmetry of the chromophore. It has been found that KCu2 (CH3COO)5 has a binuclear structure similar to that of Cu(CH3COO)2 · H2O. The crystal structures of Pd(DMSO)2(NO3)2 and Co(BrO3)2 · 6H2O were determined. In addition to being the only well refined crystal structure of a palladium (II) complex with a cis-planar configuration, it is a complex shown by the X-ray method to contain monodentate coordinated nitrate groups. Dissert. Abstr.

N70-29229 Polytechnic Inst. of Brooklyn, N.Y.
EFFECT OF ULTRASONIC WAVES ON MASS TRANSFER AND LIQUID-LIQUID EXTRACTION
Shih-Ping (Robert) Liu (Ph.D. Thesis) 1969 170 p
Avail: Univ. Microfilms: HC $7.80/Microfilm $3.00 Order No. 69-20347

The objectives of this work were: (a) to design a proper liquid-liquid extraction apparatus with ultrasonic power input; (b) to develop a suitable method for testing the ultrasonic intensity in the liquid since the existing methods appeared not adequate for this application; (c) to study the mechanism(s) involved in the stated extraction operations; (d) to investigate the effects of ultrasonic waves on the molecular diffusivities of solutes in liquids; (e) to correlate the data of extraction experiments using the information acquired. The chlorine release method proved to be an excellent method for ultrasonic intensity measurements. It gave excellent reproducibility. A relationship between the rate of chlorine release and the power input into the ultrasonic tank was definitely established. The effect of ultrasound on the molecular diffusivities was also studied in a fritted-glass diaphragm cell. Dissert. Abstr.

N70-29230# Brookhaven National Lab., Upton, N.Y.
DECONTAMINATION OF MELTER OFF-GAS CONDENSATES FROM THE PHOSPHATE GLASS PROCESS BY DISTILLATION
R. F. Drager, R. W. Johnson, and L. P. Hatch Mar. 1969 15 p refs
(BNL-50184) Avail: CFSTI

In the solidification of high level radioactive (Purex) wastes by the phosphate glass process developed at BNL, melter off-gas condensates are produced which consist mainly of nitric acid, sulfuric acid (with the use of ferrous sulfamate in the solvent extractions), phosphoric acid, and voltailized and entrained fission products, notably ruthenium. Separation and decontamination of the nitric acid and sulfric acid components by means of vacuum distillation were investigated. The highest degree of decontamination was obtained at the lowest pressure and temperature. In laboratory-scale, single-distillation experiments maximum decontamination factors of 4.3 × 1,000 and 2.2 × 10,000 were achieved for the nitric acid and the sulfuric acid fractions at 3 mm Hg pressure. Satisfactory separation of both acid fractions was accomplished in laboratory-scale and bench-scale operation. On the basis of results obtained in preliminary corrosion tests, tantalum was found to be a suitable material of construction for the distillation equipment. Author (NSA)

N70-29236 Brigham Young Univ., Provo, Utah.
THE EFFECT OF HYDROSTATIC PRESSURE ON THE CHEMICAL DIFFUSION RATE OF GOLD IN LEAD
Jack Arnold Weyland (Ph.D. Thesis) 1969 131 p
Avail: Univ. Microfilms: HC $6.40/Microfilm $3.00 Order No. 69-19926

The diffusion of gold in lead has been investigated using radioactive tracer techniques in a temperature range within 250 C of the melting point of lead for four pressures between 15 and 40 kbar. The activation energy was found to increase monotonically with pressure, from a value of 12.2 + or − 1.1 kcal/mole at 17.6 kbar, to 16.3 + or − 1.7 kcal/mole at 39.3 kbar. The activation volume was within experimental error nearly a constant at 0.36 atomic volumes over the pressure range investigated as the temperature decreased from 693 K to 493 K. A consistent mechanism for the diffusion of gold in lead is shown to be one in which the solute dissolves and diffuses both interstitially and substitutionally with the interstitial mechanism being the main contributor to the measured diffusion constant. Previous results for the diffusion of silver in lead from atmospheric pressure to 40 kbar are used to discuss the properties of the diffusion of the noble metals in lead. Results for both silver and gold diffusing in lead seem consistent with a two-component mechanism. Dissert. Abstr.

N70-29237 Pennsylvania Univ., Philadelphia.
THE DYNAMICS OF POLYMER CHAINS
Harry Stephen Grand (Ph.D. Thesis) 1969 194 p
Avail: Univ. Microfilms: HC $8.80/Microfilm $3.00 Order No. 69-21359

The linear viscoelastic behavior of polymers is studied, giving particular attention to the interpretation of data from dynamic experiments in oscillatory shear. The theory developed demonstrates ability to provide all the information necessary to completely characterize the configurations of linear and branched polymers; make rigorous the assumptions of deformation and rotation in steady flow; give quantitative interpretation to linear viscoelastic behavior of entangled networks of polymer molecules; give semiempirical interpretation to the origins of non-Newtonian flow; solve the stress relaxation problem within the framework established in the classical Rouse theory; elucidate the normal modes of motion of linear and branched polymer chains and relate these to the vibrational modes of the elastic string. Basic principles were used from such diverse fields as hydrodynamics, rheology, and irreversible statistical mechanics in the applications of the theory. Dissert. Abstr.

N70-29238 Pennsylvania Univ., Philadelphia.

SORPTION OF PURE GASES AND BINARY MIXTURES IN MOLECULAR SIEVES

Alfred Joseph Glessner (Ph.D. Thesis) 1969 112 p
Avail: Univ. Microfilms: HC $5.60/Microfilm $3.00 Order No. 69-21357

Experimental pure component sorption isotherms at low sorbate concentrations, for ethane, n-butane, and carbon dioxide in Linde type 5A molecular sieve, are examined to provide an understanding of the nature of the interactions of a sorbate molecule with a molecular sieve cavity. It is concluded from the interaction energies that for carbon dioxide the electrostatic interactions must be included in the potential function. For rare gases and normal paraffin hydrocarbons, a method of predicting low coverage sorption isotherms from the calculated second virial coefficients, using only the critical temperature and the critical volume of the gas, is described. Thermodynamically consistent activity coefficients are reported for sorbed mixtures. Although ethane-n-butane mixtures are almost an ideal solution, the ethane-carbon dioxide mixtures show strong negative deviations from Raoult's law. Dissert. Abstr.

N70-29241 Colorado Univ., Denver.

MODELS FOR PREDICTING THE DIFFUSION RATES OF GASES IN POROUS CATALYSTS AND ADSORBENTS

Henry William Haynes, Jr. (Ph.D. Thesis) 1969 332 p
Avail: Univ. Microfilms: HC $5.10/Microfilm $4.25 Order No. 69-19541

Permeability models are modified to account for the different mass transfer mechanisms encountered in porous catalysts and adsorbents. In addition several new effective diffusivity models are proposed. All of the effective diffusivity models, or models of porous structure were classified according to three groups: capillary pore models, random pore models, and network models. Nine commercially prepared materials were studied in a steady state Wicke-Kallenbach type experiment. Helium and nitrogen were directed tangentially at the opposite faces of a cylindrical sample at room temperature and over pressures ranging from 13 to 300 psia. Pressures were equalized across the pellet so that mass transfer was due entirely to a gradient in concentration. The nitrogen-rich stream was analyzed downstream of the sample for helium composition. This information was then used to calculate the helium flux diffusing through the sample pellet. The distribution of pore sizes was estimated from mercury penetration and nitrogen adsorption measurements. In addition BET surface areas, helium densities, and apparent densities were determined by conventional methods. Dissert. Abstr.

N70-29247 Kansas Univ., Lawrence.

A STUDY OF WATER: ITS NEAR-INFRARED ABSORPTION PROPERTIES, ITS STRUCTURE, AND HYDRATION

William Commodore McCabe (Ph.D. Thesis) 1969 230 p
Avail: Univ. Microfilms: HC $10.35/Microfilm $3.00 Order No. 69-21551

The near-infrared absorption properties of water are as much or more sensitive to the number of bonds between solvent and water as to the strength of a given bond. The temperature difference spectra were resolved into two component peaks which represent the effect of temperature on the structure of water. These curves were correlated with water with an ice-like structure and singly-hydrogen-bonded water. The effect of temperature on the structure of water was to convert a component of water with an ice-like structure stoichiometrically into single-hydrogen-bonded water. The hydration spectrum represents the absorption by the water interacting with the solute. It was resolved into two components which appeared to represent the hydration of the anions and cations, respectively. The other original component curve represents the volume of the hydrated solute and the amount of hydration was calculated from this component curve. It was concluded that near-infrared spectroscopy can be used to study both the quantitative and qualitative aspects of hydration. Dissert. Abstr.

N70-29249 Polytechnic Inst. of Brooklyn.

THE EFFECT OF ULTRASONIC VIBRATION ON CHEMICAL REACTION

Cheng-how Mao (Ph.D. Thesis) 1969 187 p
Avail: Univ. Microfilms: HC $8.60/Microfilm $3.00 Order No. 69-20350

The oxidation of aqueous hydrochloric acid was used as the test reaction because it is thermodynamically and kinetically unfavorable under normal circumstances. The ultrasonic vibration was supplied by a generator with a submersible transducer which was operated at a frequency of 875 KHz. The reaction rate was not a strong function of initial concentration. The yield of the reaction as a function of time can be represented by an equation in the form: Y = A(1-e to the minus Ct power) + Bt where the coefficients A, B, and C are functions of ultrasonic power and bulk temperature. Yield was found to increase with increasing ultrasonic power and decreasing bulk temperature. It is concluded that the oxidation of hydrochloric acid by ultrasonic vibration consists of two rate determining steps. Initially the rate determining step is first order with respect to chlorine, and secondly zero order in chlorine. The reactions are believed to be initiated by oxidation agents which are produced in the cavitation field. Dissert. Abstr.

N70-29255 Houston Univ., Tex.

A STUDY OF THE RESPONSES OF ELECTRON ABSORBING DERIVATIVES IN A HIGH TEMPERATURE ELECTRON ABSORPTION DETECTOR

Bruce Carlton Pettitt, Jr. (Ph.D. Thesis) 1969 88 p
Avail: Univ. Microfilms: HC $4.60/Microfilm $3.00 Order No. 69-21762

The temperature dependency of the electron absorption process was investigated for a series of derivatives chosen to be representative of those employed for the analysis of biologically important compounds. Observations were made over the temperature range 200 C - 350 C. The results are interpreted in accordance with Wentworth's kinetic model of electron attachment processes. In addition the analytical significance of high temperature operation is discussed. Operation to 350 C was made possible by the successful development of a high temperature electron absorption detector which utilizes a Ni-63 foil as the radioactive source. The design and operating parameters of this detector are presented. Dissert. Abstr.

N70-29257# Michigan State Univ., East Lansing. Dept. of Chemistry.

V CENTERS AND HYDROGEN ATOMS IN IRRADIATED HYDRAZINIUM DIHALIDES

M. T. Rogers 1969 8 p
(COO-1385-32) Avail: CFSTI

Results are reported on ESR spectral studies of $Cl2(-)$ in gamma-irradiated single crystals of hydrazinium dichloride, N2H6Cl2, and of Br2(−) in hydrazinium dibromide, both at 77 K. Hydrogen atoms rather than F2(−) were observed in hydrazinium difluoride irradiated at 77 K with 1-MeV electrons. NSA

N70-29276# California Univ., Berkeley. Lawrence Radiation Lab.
CHEMICAL BIODYNAMICS Annual Report, 1968
1 Jun. 1969 140 p refs
(Contract W-7405-eng-48)
(UCRL-18887) Avail: CFSTI

Progress was reported on: (1) Developments for studies on the complete determination of the alignment of CH2Cl2-CD2Cl2 molecules in poly-gamma-benzyl-L-glutamate solution by the NMR of Cl-35, D, and H. Also comparison was made of the electric and magnetic ordering. (2) Developments for studies on: role of trapped electrons in the radiolysis of choline chloride; and identification of the unknown compound U-2 from the C-14 benzene reaction. Studies were made on choline chloride in order to find whether thermal activation could be responsible for either diffusion of radicals or release of trapped electrons from sites that are populated with electrons during gamma irradiation. Attempts were made to identify the U-2 compound under the assumption that U-2 is a 7-carbon compound. (3) Information on plant biochemistry and animal and bacterial biochemistry. NSA

N70-29295# Michigan State Univ., East Lansing. Dept. of Chemistry.
ESR STUDY OF IRRADIATED SINGLE CRYSTALS OF ACETAMIDINE HYDROCHLORIDE
J. C. Watson and Max T. Rogers 1969 11 p
(COO-1385-31) Avail: CFSTI

Two radicals were identified in gamma-irradiated single crystals of acetamidine hydrochloride. Material irradiated and observed at 77 K shows only the ESR spectrum characteristic of the V center C12-. On warming to 125 K the spectrum of the V center was replaced by that of a new radical which showed hyperfine interaction with two equivalent alpha protons plus weaker interaction with two more distant protons. This second radical is believed to be (CH2C(NH2)2)+ radical formed by abstraction of a methyl hydrogen of an undamaged acetamidinium ion by the hole center. The g and A(Cl) tensors for C12- and the hydrogen hyperfine splitting tensor A(H) for the second radical are reported and discussed. Author (NSA)

N70-29297# Atlantic Richfield Hanford Co., Richland, Wash.
PYROCHEMICAL PROCESS FOR THE REDUCTION OF PLUTONIUM DIOXIDE TO METAL
R. E. Felt Jul. 1969 19 p refs
(Contract AT(45-1)-2130)
(ARH-1198) Avail: CFSTI

A pyrochemical process was developed for reducing plutonium dioxide directly to metal with calcium and a salt flux. Direct oxide reduction eliminates several intermediate processing steps, which generate waste streams requiring further processing. Waste recovery is nearly eliminated by this method of producing plutonium metal. The process was demonstrated by producing 2,000 grams of plutonium metal. Further equipment development is required to make the process operational. Author (NSA)

N70-29324# Arkansas Univ., Fayetteville.
PRECIPITATION FROM HOMOGENEOUS SOLUTIONS OF MIXED SOLVENTS Final Technical Report
Lester C. Howick 15 Dec. 1969 8 p
(Contract AT(40-1)-2954)
(ORO-2954-3) Avail: CFSTI

Experiments were conducted on the growth of copper(II) 8-hydroxyquinolate and nickel(II) dimethylglyoximate from acetone-water solvents. It was concluded from these and preceding studies that the chemical reaction involved in the formation of insoluble material may be influenced by solvent composition and, although this was not the case in the two systems studied here, may be the rate-determining factor in the crystal growth processes. Solvent composition changes can change the mechanism in a crystal growth process either by altering the rate of the slow step in the formation, as is the case in the nickel(II) dimethylglyoximate system, or by causing the formation of a new solid phase, as was the case in the copper(II) 9-hydroxyquinolate system. It was demonstrated that the presence of organic solvents in aqueous solutions may affect the number of heterogeneous nuclei which can function as catalysts for the crystal growth process. NSA

N70-29360 Colorado Univ., Denver.
NEUTRAL N-SUBSTITUTED ETHYLENEDIAMINE COMPLEXES OF PALLADIUM(II) AND PLATINUM(II)
Larry Lyndon Westmoreland (Ph.D. Thesis) 1969 86 p
Avail: Univ. Microfilms: HC $4.60/Microfilm $3.00 Order No. 69-19580

Differentiation between nitrogen and sulfur bonding in thiocyanate complexes has generally been accomplished by the use of mid infrared spectroscopy. This study describes the use of the far infrared region of the electromagnetic spectrum to characterize more precisely the bonding in palladium(II) thiocyanate complexes. Correlations of bond type with far infrared absorption bands are based on a number of previously characterized complexes including three pairs of linkage isomers. Absorption peaks in the region 320-290/cm and 270-260/cm were found to be indicative of sulfur and nitrogen linked thiocyanates, respectively. Dissert. Abstr.

N70-29361# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ALL-UNION CONFERENCE ON THE APPLICATION OF RADIOACTIVE AND STABLE ISOTOPES AND RADIATION IN THE NATIONAL ECONOMY AND SCIENCE. ISOTOPES AND RADIATION IN CHEMISTRY, TRANSACTIONS
Nov. 1968 96 p refs Transl. into ENGLISH from the Russian
(AD-684378; FTD-HT-23-688-68) Avail: CFSTI CSCL 7/5

Contents: Prospects for the use of nuclear radiation in chemistry; Effect of ionizing radiation on concentrated aqueous solutions of inorganic substances; Sensitization of radiochemical processes in aqueous solutions; Effect of alpha- and gamma-rays on solutions of uranium salts; Oxidation processes in organic systems exposed to ionizing radiation; Radiolysis of pentane adsorbed on solids; Action of nuclear radiation on polymer materials. TAB

N70-29362# Atomic Power Development Associates, Inc., Detroit, Mich.
EVALUATION OF THE PROPOSED ASTM METHOD FOR MEASURING OXYGEN IN SODIUM UTILIZING A ROUND ROBIN PROGRAM
S. A. Meacham and E. F. Hill Jan. 1970 82 p refs
(Contract AT(11-1)-865)
(APDA-238) Avail: CFSTI

A round robin program involving five laboratories selected for their experience with the mercury amalgamation procedure was conducted for measuring oxygen in sodium. The objective was to establish the precision of a revised mercury amalgamation analytical procedure as prepared by a ASTM subcommittee. A statistical evaluation of the results indicates a relative standard deviation of + or − 30% at the 7 ppM oxygen level and + or − 15% at the 30 ppM oxygen level. Results also demonstrated that a pinched tube method of preparing sodium samples resulted in samples that were homogeneous within + or − 25% at at 95% confidence level. Graphical analyses indicate that the procedure should be improved. The reproducibility of the analytical blank was investigated and results indicate a need for further investigation into the source of its variability. Additional work needed to improve the mercury amalgamation includes analytical blank and mercury purity studies. A revised amalgamation procedure is presented. Author (NSA)

N70-29394# Stanford Research Inst., Menlo Park, Calif.
A FUNDAMENTAL STUDY OF FUSED SALTS AND METAL-SALT SYSTEMS Annual Progress Report, 1 Jan. 1969 – 1 Jan. 1970
Daniel Cubicciotti 7 Jan. 1970 9 p refs
(Contract AT(04-3)-106)
(SRIA-106-71) Avail: CFSTI

Effort during the period was devoted mainly to studies of salt vaporization. Results of work on the vapor pressure of molten NbCl5 and the thermodynamics of NbCl5 vaporization below its critical point are presented along with results of investigations on formation of the gaseous trimer and tetramer of thallous fluoride. Research results are also included on vaporization of thallous nitrate and thallous oxide. Research in progress on thallous sulfate vaporization and liquid-vapor density of AlCl3 is discussed. NSA

N70-29397 National Lending Library for Science and Technology, Boston Spa (England).
EXPERIENCE IN THE APPLICATION OF FLUID BED DRYERS IN THE CHEMICAL INDUSTRY [OPYT VNEDRENIYA SUSHILOK S KIPYASCHIM SLOEM V KHIMICHESKUYU PROMYSHLENNOST]
I. G. Bespalov et al Feb. 1970 11 p Transl. into ENGLISH from Tr. Vses. Nauchn.-Issled. Konstrukt. Inst. Khim. Mashinostr. (USSR), no. 44, 1963 p 101 – 108
(NLL-RTS-5634) Avail: Natl. Lending Library, Boston Spa, Engl.: 20s or 3 NLL photocopy coupons

The results of laboratory investigation of fluid bed drying are reviewed and the construction of mono and multi-tier dryers is described. Experiments conducted in chemical plants show that multi-tier dryers are more economic in space requirements and metal content. Tabular data are presented for various materials and parameters tested in different plants. R.B.

N70-29448# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
POLYMERIZATION OF DIMETHYLCYCLOSILAZANES IN THE PRESENCE OF AMMONIUM CHLORIDE
G. Ya. Rumba et al 2 Sep. 1969 13 p refs Transl. into ENGLISH from Akad. Nauk Latv. SSR, Izv. Ser. Khim. (Riga), no. 2, 1967 p 160 164
(AD-701028; FTD-HT-23-1188-68) Avail: CFSTI CSCL 7/2

Experiments were conducted to obtain dimethylsilazane polymers by catalytic polymerization of dimethylcyclosilazanes in the presence of ammonium chloride and hexamethyldisilazane with and without pressure. Ammonium chloride was found to promote not only the polymerization of dimethylcyclosilazanes but also their polycondensation, especially at temperatures above 300 degrees centigrade. Due to slow decomposition by ammonium halides, the hexamethyldisilazane is hardly suitable for chain breaking during the polymerization of dimethylcyclosilazanes. Author (TAB)

N70-29463# Oak Ridge National Lab., Tenn. Chemical Technology Div.
RATES OF GAS EVOLUTION FROM THE REACTIONS OF URANIUM NITRIDE AND CARBONITRIDES WITH NITRIC ACID
Mildred Bradley Sears Feb. 1970 14 p refs
(Contract W-7405-eng-26)
(ORNL-4505) Avail: CFSTI

Gas evolution, as a function of time, is shown graphically for the reactions of – 10 + 100 mesh specimens of UN, UN sub 0.77 C sub 0.23, and UC sub 0.68 N sub 0.25 with 0.5 to 15.8 M HNO3. Author (NSA)

N70-29466# Bureau of Mines, Pittsburgh, Pa. Safety Research Center.
RESPIRATOR FILTER PENETRATION USING SODIUM CHLORIDE AEROSOL
B. I. Ferber, F. J. Brenenborg, and A. Rhode [1970] 13 p refs
(BMRI-7403) Avail: Issuing Activity

Sodium chloride aerosol was employed to determine respirator filter penetration in a manner suitable for use in Bureau of Mines approval and certification procedures. The aerosol was produced by an ultrasonic generator and treated to yield the proper conditions of relative humidity, particle size, and concentration. Respirator filters were exposed to the aerosol; filter penetration (down to 0.02 percent) was determined with a flame photometer. Results are comparable with those obtained in another laboratory using different equipment. Author

N70-29469# California Univ., Livermore. Lawrence Radiation Lab.
LOW-RESOLUTION MASS SPECTRA OF SOME SILICON-CONTAINING COMPOUNDS
R. W. Crawford, P. C. Crawford, and C. H. Otto 12 Dec. 1969 26 p refs Sponsored by AEC
(UCRL-50808) Avail: CFSTI

Low-resolution mass spectra are presented for 13 silicon-containing compounds: methylsilane, dimethylsilane, trimethylsilane, tetramethylsilane, trimethylfluorosilane, dimethyldifluorosilane, methyltrifluorosilane, dimethyldimethoxysilane, tetramethoxysilane, hexamethyldisiloxane, octamethyltrisiloxane, octamethylcyclotetrasiloxane, and decamethyltetrasiloxane. These can serve as standard spectra for use in such applications as mass spectroscopic analysis of the decomposition products of organic silicon molecules. Author (NSA)

N70-29489# Texas Univ., Austin.
ADSORPTION STUDIES AND CORROSION REACTIONS Final Report, 1 Jun. 1961 – 31 Mar. 1968
Norman Hackerman Dec. 1969 9 p refs
(Contract Nonr-375(15))
(AD-701329) Avail: CFSTI CSCL 7/4

The report summarizes research activity from 1961 to 1968 involving the physical chemistry of the metal/solution interface. Attention during this period was given primarily to iron dissolution reactions, corrosion inhibition by organic molecules, passivation of iron and iron alloys, and differential capacitance of the electrical double layer, especially in metal reaction systems. It was found that ring strain in cyclic amines is closely related to their effectiveness as corrosion inhibitors. This study is part of the long term interest of this laboratory in the relationship between the molecular structure of organic inhibitors and their effectiveness in reducing the rate of iron dissolution reactions. Evidence was also gathered to show that the primary cause of passivity with ferrous metals can be attributed to a sequence of adsorption and ion migration. Results of other related investigations are also summarized. Author (TAB)

N70-29496# Air Force Systems Command, Wright-Patterson AFB, Ohio. Materials Lab.
INFRARED DISPERSION ANALYSIS BY TIME-SHARED COMPUTATION Technical Report, Jan. – Jun. 1969
Conrad M. Phillippi Oct. 1969 22 p refs
(AD-700308; AFML-TR-69-256) Avail: CFSTI CSCL 7/4

The details of performing dispersion analyses of single crystal infrared reflection spectra by means of time-shared computation are described. The report presents and explains the symbolic program, describes the computational procedures at the remote terminal, and includes an example of four trials. The basis for employing time-shared computation in this application is discussed. Author (TAB)

N70-29533# Toledo Univ., Ohio. Dept. of Chemistry.
CHEMICAL EFFECTS OF NUCLEAR TRANSFORMATIONS, FLASH HEATING, OR FLASH PHOTOLYSIS Final Report, 1 Jan. – 30 Sep. 1969

Jack G. Kay 30 Sep. 1969 4 p
(Contract AT(11-1)-1684)
(COO-1684-11) Avail: CFSTI

The reaction of ethanol on alumina and the thermoluminescence and photoluminescence of KMnO4 crystals were studied. NSA

N70-29594# Naval Medical Research Inst., Bethesda, Md.
ANALYSIS OF METHANE AND CARBON MONOXIDE IN RESPIRATORY GASES BY GAS CHROMATOGRAPHY Medical Research Interim Report
John D O'Neal, Lee Frederick, and Harold A. Collison Nov. 1969 13 p refs
(AD-701356; NAVMED-MR005-01-0103B; Rept-23) Avail: CFSTI CSCL 6/11

A method for the analysis of ambient inspired air and of respiratory gas samples for carbon monoxide and methane is described. The gas chromatographic procedure involves separation of methane and carbon monoxide from each other and from other gases by use of a 5A molecular sieve column. The effluent from the column is mixed with hydrogen, passed over a hot nickel catalyst, and then enters the flame ionization detector (FID). Methane in the original sample is detected unchanged at the FID while carbon monoxide of the original sample is converted to methane in the catalyst bed and determined at the FID as methane. Volumes of respiratory gas samples from 2 to 10 ml. may be used depending upon the actual methane and carbon monoxide contents. Author (TAB)

N70-29599# British Iron and Steel Research Association, London (England). Operational Research Dept.
AN INVESTIGATION INTO THE EFFECTS OF RADIANT HEAT STRESS ON OPERATOR PERFORMANCE IN A CONTROL TASK
P. J. A. Ketteringham 1969 8 p refs
(PB-187828; OR/HF/10/69) Avail: CFSTI CSCL 06J

There are a number of tasks in the iron and steel industry that require operators to perform often quite complex control actions whilst being subjected to high levels of radiant heat stress. An experiment was designed to discover what operator decrements would occur in these situations. It was discovered that levels of heat stress greater than 43 mcal/sq cm/sec caused significant short term decrements on operator performance. This heat flux is appreciably below the pain threshold level recorded in the literature. It was also found that the duration of full face exposure to radiant heat stress was significantly shorter than for radiation on small areas of skin. Author (USGRDR)

N70-29608 British Steel Corp., London (England). Scottish and North West Group.
FORTRAN PROGRAMME FOR THE CORRECTION OF QUANTITATIVE ELECTRON PROBE MICRO-ANALYSER RESULTS
J. S. Miller 1969 10 p
(PB-187826; SNW(C)Y-2/1) Avail: CFSTI CSCL 07D

The report describes a computer program for calculating the true concentration of elements detected by electron probe microanalysis by making corrections for the effects of absorption and characteristic fluorescence. Author (USGRDR)

N70-29609# AC Electronics-Defense Research Labs., Santa Barbara, Calif.
A SHOCK-TUBE STUDY OF CARBON MONOXIDE DISSOCIATION USING VACUUM ULTRAVIOLET ABSORPTION
John P. Appleton, Martin Steinberg, and David J. Liquornik Dec. 1969 67 p refs
(Contracts F04701-69-C-0125; DA-01-021-AMC-11359(Z); ARPA Order 346; ARPA Order 1341)
(AD-701042; AC-DRL-TR-69-30; SAMSO-TR-69-329) Avail: CFSTI CSCL 7/4

The dissociation kinetics of carbon monoxide diluted in argon and in mixtures of oxygen in argon have been investigated over the temperature range 8000 to 15,000K behind reflected shocks using light absorption at 1176 A. An induction period 5 to 100 times longer than the vibrational relaxation time of carbon monoxide was observed in the carbon monoxide-argon mixtures prior to the establishment of the steady state dissociation rate. Rate coefficients were determined for Ar, CO, and O as the collision partner, M. Induction time measurements obtained are in excellent agreement with the previous measurements of Fairbairn. Mechanisms are advanced to account for the measured induction behavior and steady-state dissociation rates. Author (TAB)

N70-29669# Addis Translations International, Woodside, Calif.
STRUCTURE OF THE TRANSITION QUINTUPLET D (o) TO SEPTET F (2) IN EUROPIUM BENZOYLACETONATE IN SOLUTION [STRUCTURE DE LA TRANSITION QUINTUPLET D (0) TO SEPTET F (2) DANS LE BENZOYLACETONATE D'EUROPIUM EN SOLUTION]
Yves Meyer et al Oct. 1969 9 p refs Transl. into ENGLISH from Compt. Rend. Acad. Sci. (Paris), v. 259, no. 1, 6 Jul. 1964 Transl. for Calif. Univ., Berkeley. Lawrence Radiation Lab.
(PB-188096T; UCRL-Trans-10401) Avail: CFSTI CSCL 07D

The addition of certain compounds to solutions of europium benzoylacetonate in a mixture of ethanol and methanol reduces the width of the fluorescence lines (to 5 A) and increases the lifetime of the excited state. The spectra obtained at 77 K between 6100 and 6200 A are presented. These additions enable one to account for the spectroscopic differences in the spontaneous and stimulated emission of chelates according to the method of synthesis. Author (USGRDR)

N70-29670# Colorado State Univ., Fort Collins. Dept. of Chemistry.
KINETICS OF DEUTERATION OF PYRAZOLE
E. Chung Wu and John D. Vaughan [1969] 16 p refs
(Contract AT(11-1)-1620)
(COO-1620-5) Avail: CFSTI

The kinetics of deuteration of the 4 position and the 3(5) position in pyrazole was studied in sealed tubes at 200 C and higher temperatures. The mechanism proposed for 4-position deuteration involved general acid-catalyzed formation of sigma intermediates from the molecular and conjugate base forms of pyrazole. The rate of deuteration of the 3(5) position exhibited neither buffer catalysis nor pD dependence. This behavior is consistent with formation of an ylid intermediate from attack of the conjugate acid of pyrazole by OD(-) ions. Author (NSA)

N70-29697# Iowa State Univ. of Science and Technology, Ames.
ACTIVATION ANALYSIS WITH THERMAL AND FISSION NEUTRONS
Laurene Mary Menapace (Ph.D. Thesis) Nov. 1969 160 p refs
(Contract W-7405-eng-82)
(IS-T-341) Avail: CFSTI

The technique of activation analysis was used for determination of three elements in their tungsten bronzes, M(x)WO3. An internal standard method of analysis was used in the nondestructive analysis of each bronze. Standards, containing a 1:1 weight ratio of the metal to be determined and tungsten, were prepared for each bronze investigated. Both standards and samples were irradiated simultaneously, and the counting ratio of W/M in the standards compared to the counting rate ratio in the bronze. Potassium was determined by comparing the area under the 1.52 MeV photopeak from K-41 to the area under the photopeaks of interest associated with W-187. The Ho(x)WO3 bronzes were analyzed by comparing the area under the 1.38 MeV photopeak from Ho-166 to the W-187 activities. Lanthanum, in La(x)WO3, was determined by comparing the area under the 1.60 MeV photopeak of La-140 to W-187 photopeaks. The use of metastable states in activation analysis was also investigated. Author (NSA)

N70-29714 National Lending Library for Science and Technology, Boston Spa (England).

ELECTRODEPOSITION OF NICKEL WITH LOW INTERNAL STRESSES

A. S. Goralnik 6 Feb. 1970 8 p refs Transl. into ENGLISH from Zh. Prikl. Khim. (USSR), v. 42, no. 9, Sep. 1969 p 2025 – 2029
(NLL-LTI-746-436-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: .1 NLL photocopy coupons

The process of electrolyte production which permit low-stress nickel deposits are investigated. The studies show that the caproic acid in the electrolyte decreases internal stresses in the electrodeposit, the effect being reduced in the presence of brighteners such as saccharine. Author

N70-29716# Brookhaven National Lab., Upton, N.Y.

THE ATMOSPHERIC DIAGNOSTICS PROGRAM AT BROOKHAVEN NATIONAL LABORATORY Status Report

Walter D. Tucker, ed. Nov. 1969 42 p refs
(BNL-50206; SR-2) Avail: CFSTI

The Isotope Ratio Tracer Method provides a means of unambiguously tracing sulfur in the atmosphere. It is specific, and the tracer behaves exactly like pollutant sulfur, since it makes use of sulfur already in a fuel. It is a nonradioactive method and is applicable to a wide range of problems. Each of the elements necessary for its implementation has been developed and is in routine operation. This includes means of efficiently collecting samples that are adequate in size and representative of both SO sub 2 and SO sub 3 from furnace systems and SO sub 2 and sulfates from the air at ground level and aloft, methods and apparatus for quantitatively processing small samples in preparation for isotope mass measurements, and design, procurement, and operation of an isotope ratio mass spectrometer with high sensitivity. Techniques for using SF sub 6 as a collateral tracer have also been developed. The IRT method can be applied both to problems in the physical tracing of sulfur, such as in stack plumes, and to studies of the chemistry of sulfur oxides in the atmosphere. Results are reported on investigations currently under way, including combustion studies in power plants, plume dispersion from tall stacks, and pollution patterns in the small city. Author (NSA)

N70-29726# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DETERMINATION OF IMPURITIES IN ZIRCONIUM DIOXIDE

G. A. Pevtsov et al 11 Dec. 1969 8 p refs Transl. into ENGLISH from Metody Analiza Khim. Reaktivov i Preparatov (Moscow), no. 15, 1968 p 58 – 60
(AD-702280; FTD-HT-23-471-69) Avail: CFSTI CSCL 7/4

Impurities were determined in zirconium dioxide by emission spectroscopy. AgCl plus NaCl were used as a mixed carrier in order to improve sensitivity. Cr, Cu, Co, Ni, Mn were present in (1 x 10 to the -4)% amounts, and Fe and V were present in (5 x 10 to the -4)% amounts. TAB

N70-29750# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SYNTHESIS OF SOME MIXED SULFIDES OF DITHIORESORCINOL

A. M. Kuliev et al 18 Sep. 1969 7 p refs Transl. into ENGLISH from Azerb. Khim. Zh. (Azerbaidzhan SSR), no. 2, 1968 p 82 – 84
(AD-700362; FTD-HT-23-343-69) Avail: CFSTI CSCL 7/3

Eight alkyl sulfides of dithioresorcinol which had not been described in the literature were synthesized and analyzed. Author (TAB)

N70-29765# Aberdeen Univ. (Scotland). Dept. of Chemistry.

PERSULPHATE OXIDATION OF CARBOXYLIC ACIDS Final Technical Report, Oct 1968 - Sep. 1969

R. H. Thompson 31 Oct. 1969 25 p refs
(Contract DAJA37-68-C-1103)
(AD-701947; E-1287) Avail: CFSTI CSCL 7/3

Previous work on the persulphate oxidation of o-benzoylbenzoic acids, biphenyl-2-carboxylic acids and o-phenoxybenzoic acids has been extended to the oxidation of biphenyl-2-carboxylic acid amides, o-(arylthio)- and o-(arylsulphonyl)benzoic acids. Oxidation of a series of N-substituted and bz-substituted biphenyl-2-carboxylic acid amides resulted in the formation of substituted phenanthridones and the method is of general value for the synthesis of this class of compounds. In some cases the phenanthridone is accompanied by some benzocoumarin. Oxidation of 2-substituted amides may result in elimination of the substituent and these compounds are not suitable for the synthesis of substituted phenanthridones. Oxidation of o-(p-tolylthio)benzoic acid resulted in a migration of the p-tolyl group to the carboxyl radical formed initially, and subsequent dimerisation to give the di-p-tolyl ester of diphenyldisulphide-o, odicarboxylic acid. In all cases, the predominant reaction was oxidation on sulphur to the corresponding sulphoxide acids. Persulphate oxidation of o-(phenylsulphonyl)benzonic acid afforded dibenzothiophene dioxide (7%), the o-(p-nitrophenyl) analogue gave 2-nitrodibenzothiophene dioxide (1%). There was a marked reluctance of these acids to undergo oxidative cyclisation. Author (TAB)

N70-29814# Oak Ridge National Lab., Tenn. Chemistry Div.

ESTIMATION OF THE MOLECULAR WEIGHT OF THE ANOMALOUS COMPONENT OF MODIFIED WATER BY A CRYOSCOPIC METHOD

B. V. Deryagin et al Mar. 1970 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), no. 189, 1969 p 1282 – 1285
(ORNL-tr-2301) Avail: CFSTI

Calculations were carried out to permit an estimation of the molecular weight of polywater. A value of approximately 180 was obtained for average molecular weight. NSA

N70-29815# Little (Arthur D.), Inc., Cambridge, Mass.

THE INFLUENCE OF PHYSICAL VARIABLES ON SPECTRAL SIGNATURES OF NATURAL TARGETS Final Report, 1 May 1967 – 31 Dec. 1969

James R. Aronson and Alfred G. Emslie 31 Dec. 1969 113 p refs
(Contract F19628-67-C-0353)
(AD-702532; ADL-C-69339-F; AFCRL-70-0083) Avail: CFSTI CSCL 17/5

Application of remote spectroscopic techniques to target discrimination is hindered by the lack of an adequate theory of reflection and emission from complex natural surfaces. The reflection and emission signals from such surfaces depend in a complicated way on such physical variables as particle size, packing, and surface roughness. This report describes an experimental and theoretical investigation of the effect of these physical variables on the spectra of natural surfaces. Because of the complicated nature of the problem, the investigation led to the development of a detailed computer model of the spectral reflectance of particulate media. The experimental program has involved measurement of the infrared spectra of mineral powders using Fourier spectroscopy. These spectra, together with other available data, have been used to guide the development of the theory of reflectance. The theoretical treatment was based on a random interface model in which the measurable reflectance is considered to be made up of both surface and volume terms. The fundamental parameters were taken to be the refractive index, absorption coefficient, volume fraction, and particle size of the various components of a mixture of minerals. Comparisons of the computed theoretical spectra and the experimental spectra given. These comparisons show that the fundamental compositional and physical information can, to a large extent, be extracted from remote spectral measurements. That is, the observed spectral shapes and many of the variations with particle size are well accounted for by the theory. Most of the discrepancies that remain appear to be capable of rectification by certain modifications of the theory. Author (TAB)

N70-29856# Naval Research Lab., Washington, D.C.

NOTES ON THE SOLUBILITY OF LITHIUM CARBONATE IN WATER [ZAMETKA PO POVODU RASTVORIMOSTI UGLEKISLAGO LITIYA V VODE]

I. Bevada 18 Feb. 1970 3 p Transl. into ENGLISH from Zh. Obshch. Khim. (Moscow), v. 16, 1884 p 591-592
(AD-702538; NRL-TRANS-1199) Avail: CFSTI CSCL 7/4

The solubility of lithium carbonate in water is given. Mention is made to the difficulty in recording the solubility near the boiling point of water due to the turbidity of the solution. TAB

N70-29889# Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia).

NMR STUDY OF THE FERROELECTRIC TRANSITIONS IN DIGLYCINE NITRATE AND TRIS-SARCOSINE CALCIUM CHLORIDE

R. Blinc, M. Jamsek-Vilfan, G. Lahajnar, and G. Hajdukovic Jan. 1970 12 p refs Submitted for publication
(IJS-R-576) Avail: CFSTI

A proton magnetic resonance spin-lattice relaxation and second moment study of the ferroelectric transitions in diglycine nitrate, tris-sarcosine calcium chloride (TSCC) and its deuterated analogue was performed. The results support the order-disorder model of the ferroelectric transition in these compounds and demonstrate the freezing in of a flipping mode on conversion to the ferroelectric phase similar to that in glycine sulphate. Deuteration results in a shift of the Curie temperature of TSCC from 127 to 149°K. Author

N70-29893 National Bureau of Standards, Washington, D.C.

KINETIC DATA ON GAS PHASE UNIMOLECULAR REACTIONS

Sidney W. Benson (Standard Res. Inst., Menlo Park, Calif.) and H. Edward O'Neal (San Diego State Coll.) Feb. 1970 647 p refs
(NSRDS-NBS-21) Copyright. Avail: SOD $7.00 Catalog No. C13.48:21

Available rate data on thermally induced, unimolecular, homogeneous gas phase reactions of molecules and free radicals were reviewed and critically evaluated. Introductory discussion is given of theory and assumptions used in compiling the selected data. Mechanisms of reaction are discussed. The major portion presents selected data, with references, in the form of data sheets. Preferred values are indicated and discussed. Author

N70-29895# California Univ., La Jolla.

MOLECULAR DYNAMICS OF PHOTODISSOCIATION: QUASI-DIATOMIC MODEL FOR ICN

Kalman E. Holdy, Lynn C. Klotz, and Kent R. Wilson 15 Apr. 1970 52 p refs Sponsored in part by NSF, Natl. Inst. of Health, and Inst. of Gen. Med. Sci.
(Contracts DA-31-124-ARO(D)-257; N00014-69-A-0200-6020)
(AD-701923; ONR-102) Avail: CFSTI CSCL 7/5

A model for the photodissociation of ICN in its lowest continuum is developed and is used to predict the partitioning of available energy between translational, rotational and vibrational energies of the recoiling fragments. The model is based on three major assumptions 1) that only one upper electronic state is involved, 2) that light absorption affects only the breaking C- I bond, thus allowing the upper state potential surface to be calculated quasi-diatomically from spectral and thermodynamic data, and 3) that the mechanics of the 'half collision' of the recoiling fragments on this potential surface may be treated as classical to predict the average partitioning between translational, rotational and vibrational energies, and by a classical energy, forced quantum oscillator approximation to predict the partitioning between vibrational states. The model predicts that most of the available energy will go into translation, which is consistent with flash photolysis studies and with crude measurements of the photofragment spectrum. Author (TAB)

N70-29915# National Physical Lab., New Delhi (India). Radio Propagation Unit.

NEUTRAL PARTICLE AND ION CHEMISTRY AT LOW LATITUDES

A. P. Mitra 30 Sep. 1969 31 p refs Presented at 3rd Aerononry Conf., Ahmeoabad, India, Feb. 1969
(RPU-S48; SR-48) Avail: CFSTI

The reaction schemes, reaction rates, and individual chemistries are given for the minor constituents of the mesosphere. The neutral constitiuents discussed are NO, O, O3, and N. The negative ions include O2(−), O3(−), O(−), NO2(−), CO3(−)I CO4(−), and O2(−) (H2O)n. The positive ions are NO(+), O2(+), O(+), N2(+), N(+), He(+), and H(+). N.E.N.

N70-29917# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.

ELECTRON PARAMAGNETIC RESONANCE IN POLIMETHYLMETACRILATE IRRADIATED BY Co 60 [RISONANZA PARAMAGNETICA ELETTRONICA DI POLIMETILMETACRILATO IRRADIATO CON CO 60]

P. L. Indovina and A. Rosati 1 Mar. 1969 29 p refs In ITALIAN; ENGLISH summary
(ISS-69/12) Avail: CFSTI

A spectroscopic study performed by EPR on free radicals produced in a sample of polimethylmetacrilate irradiated with gamma rays emitted by a source of Co 60 is discussed. The splitting spectroscopic factor was measured at different frequencies and the time dependence of the parameters of EPR signal was studied; from this it is concluded that in the irradiated polymer only one type of free radical is formed. Furthermore an explanation is given of the observed spectrum in terms of the molecular conformation of the radical. Author

N70-29932# Texas Univ., Austin. Dept. of Chemistry.

ORGANIC CHEMICAL PHYSICS Final Report, 1 Dec. 1965 - 31 Dec. 1969

Michael J. S. Dewar 31 Dec. 1969 47 p refs
(Grants AF-AFOSR-1050-66; AF-AFOSR-1050-67; AF-AFOSR-1050A-67; AF-AFOSR-1050B-67)
(AD-702534; AFOSR-70-0788TR) Avail: CFSTI CSCL 7/4

Presented is a summary of research to develop a semiempirical SCF MO treatment of organic molecules, accurate enough to be used as a practical chemical tool in the study of their structures and reactivities. This has involved a combined theoretical-experimental approach, i.e. the experimental work providing data needed to determine parameters in the theoretical treatment and tests of predictions. The latest treatment (MINDO/2) gives heats of atomization mostly to plus or minus 5 kcal/mole, bond lengths to plus or minus 0.03A, and force constants to plus or minus 10% for hydrocarbons and plus or minus-%% for compounds containing nitrogen or oxygen. Published reports and those in progress are listed. TAB

N70-29937 National Lending Library for Science and Technology, Boston Spa (England).

ELECTROCHEMICAL INVESTIGATION OF RHODIUM AND OSMIUM ELECTRODE CATALYSTS, COMMUNICATION 1

T. M. Grishina et al 6 Feb. 1970 4 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 2, Khim. (Moscow), v. 17, no. 2, 1962 p 53-56
(NLL-Trans-746-387-(9022.401)) Avail: Natl. Lending Library,

Boston Spa, Engl.: .1 NLL photocopy coupons

The electrochemical properties of rhodium and osmium electrodes and their adsorption capacity in relation to hydrogen are investigated. The charge curves on rhodium and osmium electrodes in different electrolytes are obtained and a method of osmium-plating a platinum electrode is devised. Author

N70-29946 National Lending Library for Science and Technology, Boston Spa (England).

ELECTROCHEMICAL INVESTIGATION OF RHODIUM AND OSMIUM ELECTRODE CATALYSTS. 2: EFFECT OF POISONING ON CAPACITY OF RHODIUM ELECTRODE

T. M. Grishina et al 6 Feb. 1970 5 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 2 Khim. (Moscow), v. 18, 1963 p 48-51
(NLL-Trans-746-388-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: .1 NLL photocopy coupons

Earlier studies of the effects of arsenic and mercury poisons on a platinum electrode show that arsenic increases the energy of the coupling of adsorbed hydrogen, while mercury is a typical desorbent of hydrogen. The effect of progressive poisoning on the properties of rhodium and osmium electrode catalysts is investigated with respect to rhodium electrodes, and the results show that the coupling energy of adsorbed hydrogen varies negligibly. R.B.

N70-29954# Mound Lab., Miamisburg, Ohio.

BIBLIOGRAPHY OF SELECTED METAL HYDRIDES

B. F. Hammond and H. R. Ratcliffe 6 Feb. 1970 36 p refs
(Contract AT(33-1)-GEN-53)
(MLM-1673) Avail: CFSTI

This bibliography containing 358 references pertaining to alkali, alkaline earth, transition metal, rare earth, thorium, and uranium hydrides was collected from major American, European, and Russian journals covering a period from 1950 to 1968. Eighteen of the references were published prior to that period. Author (NSA)

N70-29992# Temple Univ. Research Inst., Philadelphia, Pa.

UPPER ATMOSPHERE CHEMICAL REACTION STUDIES Final Report, 1 Jan. - 31 Aug. 1969

Alex G. Streng, William J. Murphy, and Charles S. Stokes 15 Sep. 1969 33 p refs
(Contract F19628-69-C-0131)
(AD-701052; RITU-1969-14; AFCRL-69-05-04) Avail: CFSTI CSCL 4/1

Reaction of the trimethyl aluminum/triethyl aluminum (TMA/TEA) mixture (80% by weight of TMA plus 20% of TEA) at conditions simulating the upper atmosphere at the height of about 80,000 feet have been investigated. Experiments were performed in a 1500 cu. ft. vacuum tank. The amount of the GMA/TEA mixture released varied from 174 to 385 g. The mixture was released either alone or with simultaneous release of H_2O, O_2, or Cl_2 in amounts varying from 6.7 to 14.65% by weight relating to the amount of the TMA/TEA mixture used. The release time in all the experiments was 5 sec. The gaseous reaction products formed have been investigated and the luminosity and the temperature of the reaction were measured. The mechanism of the reactions proceeding at upper atmosphere is discussed. Author (TAB)

N70-30010# Adelphi Univ., Garden City, N.Y.

CORE POLARIZATION EFFECT IN HYPERFINE STRUCTURE Final Report, 1 Jun. 1966 - 31 Jan. 1969

Edward A. Burke 1970 7 p refs
(Grant DA-ARO(D)-31-124-G839)
(AD-701122; AROD-6736-4-P) Avail: CFSTI CSCL 7/4

A two-determinant approximation which allows for correlation via exchange between all s-electrons and the valence electrons is the subject of this summary. Three general methods were tried: (a) analytic Slater-type orbitals applied to ground state of boron, (b) analytic Hylleraas-type orbitals applied to ground state of beryllium and (c) numerical orbitals applied to the ground state of lithium. Author (TAB)

N70-30017# Nebraska Univ., Lincoln. Dept. of Chemistry.

HALOGEN ATOM REACTIONS ACTIVATED BY RADIATIVE NEUTRON CAPTURE AND Br-82 AND I-130 ISOMERIC TRANSITION Progress Report, Feb. 1969 - Feb. 1970

15 Feb. 1970 96 p refs
(Contract AT(11-1)-1617)
(COO-1617-19; PR-4) Avail: CFSTI

Developments in research are reported for the following studies: radiometric analysis of serum and tissue proteins; radiative neutron capture and isomeric transition activated reactions of halogens and interhalogens in liquid (25 deg) and solid (77 K) benzene; application of isotopically labeled bromine for the determination of trace unsaturation in alkanes; a study of the various nuclear processes of iodine (I-127)2 and (I-129)2 and iodine monochloride in selected alkylbenzenes and cyclopentane; gas phase reactions of I-128, I-130 + I-130m, Cl-38 activated by radiative neutron capture, and I-130 activated by isomeric transition in CH_4, CD_4, and polyhalomethanes; and Szilard-Chalmers organic yields in liquid and solid alkyl iodides. NSA

N70-30018# Kentucky Univ., Lexington. Dept. of Chemistry.

PROPERTIES AND STRUCTURES OF SOLVATES OF METAL CHELATES ENCOUNTERED IN SOLVENT EXTRACTION SYSTEMS Progress Report, 1 Jan. - 31 Dec. 1969

William F. Wagner and Donald E. Sands 22 Jan. 1970 6 p
(Contract AT(40-1)-2124)
(ORO-2124-22) Avail: CFSTI

Complexes of rare earths that form in various solvent extraction systems are discussed. NSA

N70-30019# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CHEMISTRY OF HETEROORGANIC COMPOUNDS

N. A. Volkenau 13 Nov. 1969 143 p refs Transl. into ENGLISH from the Russian
(AD-701018; FTD-MT-24-187-69) Avail: CFSTI CSCL 7/3

The report discusses the chemistry of heteroorganic compounds. It deals primarily with the history and major developments in this field as they relate to the USSR and Soviet scientists. The following is a breakdown in which this history is presented: Organomagnesium compounds and organic derivatives of alkali metals; Organic derivatives of mercury, zinc, and cadmium; Organic derivatives of germanium, tin, and lead; Organophosphorus compounds; Organometallic compounds of the arsenic subgroup; Organofluorine compounds; Onium compounds; and Organic derivatives of the transition metals (most detailed relative to research on ferrocene). A Bibliography of 660 entries (primarily Soviet) is also included. Author (TAB)

N70-30020# Dow Chemical Co., Golden, Colo. Rocky Flats Div.

RADIOLYSIS OF DIISOPROPYLAMINE AND DIISOPROPYLAMINE HYDROCHLORIDE

Armen R. Kazanjian 25 Feb. 1970 3 p
(Contract AT(29-1)-1106)
(RFP-1439) Avail: CFSTI

Diisopropylamine (DIA) is the stabilizer commonly used in trichlorethylene, a solvent used for cleaning plutonium. Diisopropylamine hydrochloride (DIA·HC1) is the hydrochloric acid salt of DIA that is formed in the stabilized solvent by radiative or thermal decomposition. Radiolysis was done to determine the potential corrosion to plutonium from the radiolytic decomposition of these two compounds. Both compounds were gamma irradiated in air and under vacuum. The major radiolysis products are hydrogen and methane. Acetone and carbon monoxide are also produced in the presence of air. Hydrogen is the most abundant product with G values from 1 to 4 depending on the compound and conditions. Especially important from a corrosion standpoint was the fact that HCl was never detected as a product in DIA· HCl. It was concluded that the hydrogen yield from DIA-HCl may be corrosive toward plutonium because the low vapor pressure of DIA·HCl makes long exposures possible. Author (NSA)

N70-30029 National Lending Library for Science and Technology, Boston Spa (England).
THE FROST-RESISTANCE OF AQUEOUS DISPERSIONS OF POLYVINYLACETATE [K VOPROSU O MOROZOSTOIKOSTI POLIVINILATSETATNYKH VODNYKH DISPERSII]
H. E. Akopyan et al Oct. 1968 14 p refs Transl. into ENGLISH from Arm. Khim. Zh. (Armenian SSR), v. 20, no. 11, 1967 p 926 – 931
(NLL-RTS-5343) Avail: Natl. Lending Library, Boston Spa, Engl.: 15s or 2 NLL photocopy coupons

To promote the development of new emulsion systems which give frost-resistant aqueous dispersions of polyvinylacetate, investigations were conducted to determine the influence on frost-resistance of such important factors as: (1) the character and concentration of the emulsifier of the protective colloids used; (2) the degree of saturation of the adsorption layers and the surface tension of the dispersion; (3) the size of the polymeric particles and the magnitude of their electric charge; and (4) the pH and viscosity of the medium. The polymerization of vinyl acetate was accomplished in the presence of small additions of calcium chloride and an estimation of the frost-resistance of the dispersions was carried out by alternate freezing and thawing of the samples in an acetone, dry ice cooling mixture. Electron microscopy measurements of the influence of the various factors on the properties and frost-resistance of the dispersions are tabulated and the significance of these data are discussed. D.L.G.

N70-30034*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VISUAL APPEARANCE OF POLYMERIC CONTAMINATION
Harold Shapiro Washington Jun. 1970 15 p ref
(NASA-TN-D-5839; G-967) Avail: CFSTI CSCL 07C

This paper presents a series of photomicrographs which shows the condensate that a selected group of polymers might have if they were present as spacecraft contaminants. Nine classes of polymeric materials were subjected to temperature and vacuum conditions, and, using microscopic techniques, the condensed effluents were observed. Outgassing data are presented for some materials in the form of weight loss. Photographic material is presented for seven classes; however, for the remaining two classes, the techniques appeared inapplicable. The concept that the appearance of condensate might be unique for each class of polymer is of limited value. The condensate pattern varied as a function of the temperature of the base material for all except one of the seven classes that were photographed. The similarity in the patterns of several classes of polymers makes identification of a particular species problematic. Author

N70-30058# Minnesota Univ., Minneapolis. Dept. of Chemistry.
PHOTOCHEMICAL STUDIES OF POLYATOMIC MOLECULES, ESPECIALLY OF THEIR LABILE ENERGY-RICH STATES Final Report, 1 Jun. 1959 – 30 Sep. 1969
Robert Livingston 1969 13 p refs
(Contracts DA-11-022-ORD-3067; DA-ARO(D)-31-124 -6736)
(AD-701926; AROD-2397-16-C) Avail: CFSTI CSCL 7/5

The report summarizes a study of the kinetics and quantum yields of photochemical reactions and the intrinsic properties and chemical reactivities of excited states of polyatomic aromatic molecules. Author (TAB)

N70-30065# California Univ., Berkeley. Lawrence Radiation Lab.
PHOTOCHEMISTRY OF IODINE
Joel B. Tellinghuisen (Ph.D. Thesis) Nov. 1969 209 p refs
(Contract W-7405-eng-48)
(UCRL-19112) Avail: CFSTI

A method of atomic fluorescence spectroscopy was developed and used to detect iodine atoms at concentrations as low as 1 × 10 to the 10th power cc in several photochemical processes. The heart of the apparatus is a solar-blind photomultiplier having practically no sensitivity to radiation of wavelengths greater than 2500 A, but with good response in the region of the two strong iodine atomic resonance lines near 1800 A. Electrodeless discharge sources are employed to excite the fluorescence under optimum signal to noise conditions. The method is applied to the problem of predissociation in I2, and used to study diffusion and wall reactions of iodine atoms. The absorption data at 1830 A are used to calculate a rough lifetime of 10+ or −5 nsec for the I2 excited state. This value is an order of magnitude greater than estimates from extinction measurements, suggesting that several molecular transitions may be contributing to the total absorption in this region. Author

N70-30071# Michigan State Univ., East Lansing.
VAPOR PRESSURE MEASUREMENTS IN THE SmC2C AND TmC2-C SYSTEMS
Robert L. Seiver and Harry A. Eick [1969] 12 p refs
(Contract AT(11-1)-716)
(COO-716-55; CONF-700403-2) Avail: CFSTI

Samarium and thulium dicarbides were prepared by direct reaction of the elements in sealed tantalum bombs and an extensive study of their vaporization behavior was completed. Container interaction which was observed was demonstrated to have negligible effect on the measured decomposition pressures. The cause of the large discrepancies in previous reports of the SmC2 decomposition pressure was found to be oxygen contamination. The oxide probably resulted from hydrolysis by atmospheric water vapor. Samples were observed to hydrolyze significantly even in a P2O5 charged glovebox. Handling procedures necessary to prevent this hydrolysis are discussed. The correct value of the decomposition pressure of samarium in equilibrium with SmC2(s) and that of thulium in equilibrium with TmC2(s) are presented. Results of second- and third-law data reductions are reported. The data extend the correlation between enthalpy of vaporization of the lanthanide dicarbides and vapor pressure of the pure metal. Author (NSA)

N70-30079# General Electric Co., Pleasanton, Calif. Nucleonics Div.
A THERMODYNAMIC DATA PROGRAM INVOLVING PLUTONIA AND URBANIA AT HIGH TEMPERATURES Quarterly Report, 1 May – 1 Aug. 1969
E. A. Aitken and S. K. Evans Sep. 1969 7 p refs
(Contract AT(04-3)-189)
(GEAP-12032) Avail: CFSTI

Progress is reported on scope of work related to measurement of liquidus-solidus transformations, vaporization of urania, and oxygen redistribution in a temperature gradient. In addition, the scope of new experiments in progress to study interactions in the sodium-uranium-plutonia system is presented. Author (NSA)

N70-30109# Battery Corp. of America, Red Bank, N.J.
TRANSIENT METHODS FOR ANALYSIS OF ELECTROCHEMICAL KINETICS Final Report, 1 Oct. 1968 – 30 Sep. 1969
Jorge E. A. Toni Fort Monmouth, N.J. ECOM Dec. 1969 96 p refs
(Contract DAAB07-69-C-0056)
(AD-701918; ECOM-0056-F) Avail: CFSTI CSCL 7/4

The report includes a review of relaxation methods and describes the principal achievements in the following areas:

Instrumentation: Two new circuits for the independent control of two working electrodes (ring-disc assemble) in the same electrolyte are described: Characterization of mercury batteries by pulse techniques: It was proved that pulse methods can give promising results concerning the state of charge of mercury batteries; Electroreduction of m-dinitrobenzene: The mechanism of m-DNB reduction in Mg(ClO4)2 solution correspond to an ECECE mechanism. An electrode mechanism consistent with the experimental data was postulated; Oxidation of zinc anode: The evaluation of oxidation and reduction processes of zinc gave supporting data for an adsorption model instead of the classical dissolution-precipitation model assigned to the passivation of zinc anode; Dissolution rate measurement: Utilizing the rotating ring-disc electrode concept, a new theory for the measurement of dissolution and corrosion rates was developed. Author (TAB)

N70-30124# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Physikalische Chemie.

CONCERNING gamma RADIATION OF CARBON MONOXIDE-METHANE MIXTURES [ZUR gamma-RADIOLYSE VON KOHLENMONOXID-METHAN-GEMISCHEN]

W. Borger Dec. 1968 42 p refs In GERMAN
(JUL-563-PC) Avail: CFSTI

The gamma radiation of carbon monoxide-methane mixtures in the gas phase yields as primary products hydrogen, ethane, ethylene, acetylene, propane, n and i butane, carbon monoxide, formaldehyde, acetaldehyde, acetone, butanol, and diacetyl as well as a high boiling point brown oil. For a quantity of this compound the dependance of the G-value on the concentration of the reaction partners and the absorbed dose was determined. A mechanism for the structure of ethane, acetone, acetaldehyde, and diacetyl methyl and acetyl radicals is discussed which is in agreement with the experimental results. Transl. by P.N.F.

N70-30142# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

BASIC PARAMETERS OF RAMAN SCATTERING LINES FOR ALKOXYSILANES OF THE SERIES (CH3)(n) Si(OC2H5)(4-n) (n=0-3)

L. A. Ozolin et al 11 Dec. 1969 17 p refs Transl. into ENGLISH of Izv. Akad. Nauk Latv. SSR, Ser. Khim (Riga), no. 2, 1968 p 149-156
(AD-703175; FTD-HT-23-468-69) Avail: CFSTI CSCL 7/4

Measurements were made of the frequency, integral intensity, degree of depolarization, and width of lines in spectra of Raman scattering of ethoxysilanes in the series ((CH3)n)Si((OC2H5)4-n) (n equals 0-3). Standard intensities and invariants of the arbitrary tensor of polarizability were calculated. An interpretation of the vibration spectra was made. The force coefficients were evaluated for the framework of the molecules. Author (TAB)

N70-30148# Arkansas Univ., Fayetteville. Dept. of Chemistry.

THE MECHANISM OF THE REACTIONS OF AROMATIC HYDROCARBONS WITH HYDROGEN ON METALLIC CATALYSTS Final Report, 1 Dec. 1964 - 31 Jan. 1969

Samuel Siegel Feb. 1970 32 p refs
(Grant DA-ARO(D)-31-124-G621)
(AD-701123; AROD-5258-1-C) Avail: CFSTI CSCL 7/3

The mechanism of the catalytic hydrogenation of the benzene ring is clarified by examining the kinetics of the reaction of a number of tert-butyl substituted benzenes: (t-butyl-(1), 1,3-di-t-butyl-(2), and 1,4-di-t-butylbenzene (3) and 4-t-butyltoluene (4) over an alumina supported rhodium catalyst. The rates are zero order in substrate, first order in hydrogen, and increase in the sequence 1,2,4,3. In competitive experiments the order of reactivity is 1,4,2,3 which, via a quantitative treatment of a conventional mechanistic scheme, yields the relative adsorption coefficients of 1.0, 0.10, 0.02 and 0.01 respectively. Apparently, the substitution of a t-butyl-group for a hydrogen atom affects the energy of the transition state for the reduction to a much lesser extent than it increases the energy of the absorbed aromatic hydrocarbon. An unusually large amount of the intermediate cycloalkene, 1,4-di-t-butylcyclohexene, is formed from 3. The reduction of 2 is similar to 3, although the maximum concentration of the intermediate cycloalkene is much less so that the kinetics of its formation and disappearance is not easily measured. Author (TAB)

N70-30171# Naval Research Lab., Washington, D.C.

OBSERVATIONS OF NONLINEAR ABSORPTION IN CERTAIN ORGANIC SUBSTANCES [NABLYUD ENIE NELINEINOGO POGLOSHCHENIYA V NEKOTORYKH ORGANICHESKIKH VESHCHES TVAKH]

G. V. Venkin et al 18 Feb. 1970 4 p ref Transl. into ENGLISH from the Russian
(AD-702536; NRL-TRANS-1198) Avail: CFSTI CSCL 7/4

The anomalous absorption of ruby laser light during experiments on stimulated Raman scattering (SRS) with focused beams in optically transparent organic liquids is discussed. These studies involved organic materials having an absorption coefficient less than 0.03/cm in the visible region (such as cyclohexane, cyclohexene, benzene, heptane, and so on). TAB

N70-30175# Oak Ridge National Lab., Tenn.

CONTRIBUTION TO THERMOANALYTICAL STUDY OF THE DECOMPOSITION AND REDUCTION OF SULFATES, 1

A. J. Hegedues and K. Fukker 1969 12 p refs Transl. into ENGLISH from Z. Anorg. Allgem. Chem. (Leipzig), v. 284, 1956 p 20-30
(PB-188099T; ORNL-TR-1616) Avail: CFSTI CSCL 07D

Decomposition temperatures were determined for sulfates of the various elements and corresponding transition elements in groups I, II, and III of the periodic system, by means of thermogravimetric analysis in air at one atmosphere pressure in the temperature range 20/1000C. In parallel experiments in the same temperature range, weight-temperature curves were traced for the reduction of these same sulfates in a current of pure hydrogen as well as a mixture of 30% hydrogen in nitrogen. Author (USGRDR)

N70-30180 National Lending Library for Science and Technology, Boston Spa (England).

STRUCTURE OF A MATHEMATICAL MODEL OF THE FLUIDIZED-BED ROASTING PROCESSES WITH GROWTH OF INITIAL PARTICLES

I. A. Burovoi et al 6 Feb. 1970 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Tsvet. Met. (Dzaudzhikau), v. 12, no. 3, 1969 p 144-150 In RUSSIAN and ENGLISH
(NLL-Trans-746-368-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: .1 NLL photocopy coupons

The structure of a mathematical model allowing for initial particle growth is proposed and developed by a method described in the example of fluidized bed roasting of a nickel concentrate from flotation separation of copper-nickel converter matte. The characteristics of the process and the results of experimental investigations were used. After the structure was made more precise and the numerical values of the coefficients were determined, the model was proposed for development of algorithms for the best process control. Author

N70-30186# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

METHODS OF INVESTIGATING SURFACE CHEMICAL COMPOUNDS WITH THE AID OF IR SPECTROSCOPY

L. P. Morozova et al 3 Oct. 1969 13 p refs Transl. into ENGLISH from Nauch. Konf. Po Fiz.-Khim. Mekh. Poristykh i Voloknistykh Dispersnykh Strukt. Materialov (Riga), 1967 p 509-514
(AD-700461; FTD-MT-24-266-69) Avail: CFSTI CSCL 7/4

A brief review of different infrared spectroscopic methods used in the study of chemical compounds formed on surfaces is presented. The results obtained by the present authors and others for porous glass treated with water vapor and different modifying agents (trimethylchlorosilane, dimethyldichlorosilane, methacrylic acid, and styrene) are presented. Experiments have shown that the adhesive bond strength of polystyrene to glass surfaces unmodified and modified with trimethylchlorosilane was 4460 and 88.5 erg/(sq cm) respectively. It is concluded that infrared spectroscopic methods may be successfully employed in the study of surface bond formation. Author (TAB)

N70-30211# Erlangen Univ. (West Germany). Lehrstuhl fuer Technische Chemie 1.

INVESTIGATIONS ON FLOTATION KINETICS [UNTERSUCHUNGEN ZUR FLOTATIONSKINETIK]

Peter Lengler (Ph.D. Thesis) 1969 141 p refs In GERMAN
Avail: CFSTI

Based on the analogy of flotation and adsorption, flotation kinetic equations are derived using Langmuir's theory. These indicate that the flotation velocity follows from boundary layer throughput and the loading of these boundary layers. Calculations for a one-component system were extended to many-component systems and the processes in the foam phase were also considered. Relzions were obtained for flotation velocities and selectivities, containing only clearly defined and measureable magnitudes. The derived equations allow one to calculate the flotation velocity and the selectivity of a technical cell from the results of laboratory experiments. Author (ESRO)

N70-30241# Aerospace Corp., El Segundo, Calif. Lab. Operations.

RADIATION-INDUCED LINE BROADENING OF THE PRINCIPAL SERIES OF SODIUM, MAY - DECEMBER 1968

Peter E. Oettinger 15 Jan. 1970 18 p refs
(Contract F04701-69-C-0066)
(AD-702439; TR-0066(9220-02)-4; SAMSO-TR-70-76) Avail: CFSTI CSCL 7/4

Continuum radiation from a high-intensity flashtube was passed through sodium vapor in order to investigate the absorption spectra of high-lying sodium principal series transitions. The results indicate that the radiation from the source causes sufficient line broadening near the series limit so that the individual lines become nonresolvable. The number of lines observed is correlated with variations in the radiation field intensity. Author (TAB)

N70-30268# Air Force Systems Command, Wright-Patterson AFB, Ohio. Nonmetallic Materials Div.

CHARACTERIZATION OF VERY PAUCI-DISPERSE SYSTEMS WITH STRONG INTERACTION BY EQUILIBRIUM SEDIMENTATION. PART 1: DETERMINATION OF MOLECULAR WEIGHTS AND PARTIAL EVALUATION OF INTERACTION MATRIX Technical Report, Jan. 1968 - Apr. 1969

Matatiahu T. Gehatia and Donald R. Wiff Jan. 1970 67 p refs
(AD-702458; AFML-TR-69-235-pt-1) Avail: CFSTI CSCL 11/9

Aromatic-heterocyclic polymers are a class of interesting materials that are currently being developed due to their resistance to high temperature. Relatively little has been done toward determining many of the fundamental parameters that govern the physical behavior of these chains. This report covers one phase of an investigation of the dilute solution properties of one of the earlier, high molecular weight aromatic-heterocycles, poly(2,2-m-phenylene-5,5-bibenzimidazole) (PBI), dissolved in a good solvent dimethylacetamide (DMAC). Specifically this report concerns equilibrium sedimentation measurements on samples of this polymer in an effort to define molecular weight, and polymer-polymer interaction parameters. Preliminary measurements on these samples suggested that each sample consists of a relatively small number of rather discrete molecular weight ranges. In addition, it was suspected that relatively strong interactions could exist between various species. Therefore, early consideration was given to describing this situation by applying a method developed from study of pauci-disperse systems. Author (TAB)

N70-30272# Rochester Univ., N.Y. Dept. of Chemistry.

ELECTRONIC SPECTRA AND STRUCTURE OF POLYATOMIC MOLECULES Final Report, Sep. 1958 Oct. 1968

A. B. F. Duncan Feb. 1970 9 p refs
(Contract Nonr-668(15))
(AD-700324) Avail: CFSTI CSCL 7/4

References to published research on molecular structure and spectra in the vacuum ultraviolet region are given for certain polyatomic molecules. Abstract of unpublished work and uncomplete work are appended. Author (TAB)

N70-30282# Dordt Coll., Sioux Center, Iowa. Dept. of Chemistry.

SITE DENSITIES OF SOLID CATALYSTS

Russell W. Maatman [1969] 19 p refs Sponsored in part by Am. Chem. Soc.
(Contract AT(11-1)-1354)
(COO-1354-18) Avail: CFSTI

The number of catalytically active sites per unit area, the site density, is often several orders of magnitude less than usually supposed. From the results obtained for representative systems, it is estimated that in 20 - 40% of modern catalytic systems the site densities are 1/10 to the 11th power sq cm (i.e., 0.01% coverage) or less, with many site densities 1/10 to the 9th power sq cm or less. Several unrelated methods of obtaining site densities lead to the same general conclusion. The representative catalysts are amorphous and crystalline acidic oxides, transition metal and rare earth oxides, transition metals, and salts. The reactions discussed are hydrocarbon isomerization, cracking, and polymerization; decomposition of NH_3, HCOOH, and alcohols; oxidation, hydrogenation, and dehydrogenation; O transfer, p-o H_2 conversion, and H_2-D_2 equilibration. It is shown that in spite of the frequency of occurrence of low site densities, that high site densities are often uncritically assumed. Therefore, attempts to correlate surface properties with catalytic activity are open to question. Author

N70-30296# Iowa State Univ. of Science and Technology, Ames.

THE PREPARATION OF HIGH PURITY DYSPROSIUM, HOLMIUM AND ERBIUM BY THE LITHIUM REDUCTION OF THEIR TRICHLORIDE SALTS

John Joseph Croat (M.S. Thesis) Nov. 1969 114 p refs
(Contract W-7405-eng-82)
(IS-T-346) Avail: CFSTI

Reductions of the anhydrous chloride with Li proved to be a possible alternative to the Ca-RF_3 process now used to prepare Dy, Ho, and Er. These liquid-vapor reductions were carried out at 900 C and resulted in 96% yields of metal containing low to moderate amounts of gaseous impurities. In addition the method proved effective in eliminating F without adding characteristic impurities such as Cl and Li. The overall purity of the as-reduced metal prepared from singly distilled chlorides averaged 99.94 wt % or 99.20 at. % while as-reduced metal prepared from doubly distilled chlorides averaged 99.97 wt % or 99.70 at. %. The purity of the sublimed metal prepared from both singly and doubly distilled chlorides averaged 99.98 wt % or 99.90 at. %. Melting points, lattice parameters, and resistivity ratios were determined on both the as-reduced and sublimed Dy, Ho, and Er. These results were compared with sublimed metal prepared from the rare earth fluoride. Author (NSA)

N70-30332# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SYNTHESIS AND INVESTIGATION OF PROPAR PROPARGYLACRYLATE POLYMERS UNDER THE

INFLUENCE OF PEROXY INITIATORS

M. A. Askarov et al 11 Dec. 1969 8 p refs Transl. into ENGLISH from Uzbeksk. Khim. Zh. (USSR), v. 12, no. 3, 1968 p 50–52
(AD-702292; FTD-HT-23-467-69) Avail: CFSTI

Polymerization of propargylacrylate Pr A and propargylmethacrylate Pr MA in bulk and dioxane solution was studied with benzoyl peroxide and azobisisobutyronitrile initiators at 60, 70 and 80 C, and solubility and cross linking of the formed polymers were evaluated. Polymerization rates increased with temperature as shown, and the yield increased with 0.1–0.6 percent initiator used. Bulk polymerization resulted in formation of insoluble glassy polymers, and solution polymerization resulted in initial formation of linear and soluble polymers, which become insoluble when the yield of 35–40 percent is reached. IR-spectroscopy and determination of intrinsic viscosity revealed the presence of acetylenic and cyclic links in the linear chains of the soluble product and its conversion under cross linking. The results indicate that soluble polypropargylacrylate and polypropargylmethacrylate can be produced, and converted by thermal treating into cross linked resins. Author (TAB)

N70-30336# Mound Lab., Miamisburg, Ohio.

NATURE OF THE STEADY STATE OF PU-238 IN DILUTE NITRIC AND HYDROCHLORIC ACIDS

G. L. Silver 6 Mar. 1970 14 p refs
(Contract AT(33-1)-GEN-53)
(MLM-1709) Avail: CFSTI

The nature of the steady state of plutonium-238 in dilute nitric acid has been reexamined. The concentration of hexavalent plutonium at steady state was lower than previously reported, and depended upon the total plutonium concentration. The use of tristimulus colorimetry for studying plutonium solutions is discussed, and the preparation of solutions of pentavalent plutonium is described. The nature of the steady state of plutonium-238 in dilute hydrochloric acid is mentioned. Author (NSA)

N70-30337# United Nuclear Corp., Elmsform, N.Y. Research and Engineering Center.

DEVELOPMENT OF ANALYTICAL METHODS FOR THE DETERMINATION OF NITROGEN IN SODIUM Final Report

C. C. Gregg Feb. 1970 39 p refs
(Contract AT(30-1)-4070)
(UNC-5245; NYO-4070-1) Avail: CFSTI

Development of an analytical method for the determination of chemically combined nitrogen in sodium is described. The method is based upon fusion of sodium with lithium at 650 C, followed by solution of the mixture, steam distillation, and spectrophotometric measurement of the distillate. Successful application to nitrogen combined as nitrate, cyanide, and cyanate is demonstrated. Incomplete recoveries of nitrogen added as nitrite are found. An alternative technique based on fusion with sodium hydroxide in a hydrogen atmosphere is shown to yield incomplete recoveries of chemically combined nitrogen in sodium. Author (NSA)

N70-30358# Atomics International, Canoga Park, Calif. Liquid Metal Engineering Center.

SOLUBILITY AND DIFFUSIVITY OF INERT GASES IN LIQUID SODIUM, POTASSIUM, AND NaK

E. L. Reed and J. J. Droher 31 Jan. 1970 32 p refs
(Contract AT(04-3)-700)
(LMEC-69-36) Avail: CFSTI

The literature was surveyed for data on the solubility and diffusivity of rare gases and nitrogen in liquid sodium, potassium, and NaK. Experimental data were found for the solubilities of helium, argon, drypton, xenon, and nitrogen in liquid sodium; solubility data also were found for helium in liquid potassium. Estimates of solubility were made for the solubility of helium and of argon in eutectic NaK. Nitrogen appears to dissolve as the dimer, while the rare gases dissolve as the monomer. The solubilities of rare gases increased in a consistent manner with decreasing atomic radius of the rare-gas solute atom; conversely, the solubility of a given gas decreased with decreasing atomic radius of the solvent liquid-metal atom. Diffusivity values were calculated for the systems of interest using the Stokes–Einstein equation, derived from Fick's Law. Author (NSA)

N70-30360# Minnesota Univ., Minneapolis. School of Mineral and Metallurgical Engineering.

INTERGRANULAR BRITTLENESS STUDIES IN W USING AUGER SPECTROSCOPY

A. Joshi and D. F. Stein 2 Feb. 1970 16 p refs
(Contract AT(11-1)-1778)
(COO-1778-4) Avail: CFSTI

Results of an investigation aimed at understanding the problem of brittleness in powder metallurgy tungsten by utilizing Auger Electron Emission Spectroscopy as a tool for direct chemical analysis of fracture surfaces are reported. Substantial segregation of P to the grain boundaries was observed in tungsten and the concentration of P can be related to the ductile-brittle transition temperatures. The amount of segregation was dependent upon the grain size— the larger the grain size, the greater the concentration of P at the grain boundary and the associated embrittlement. Author (NSA)

N70-30366# Atomic Energy Commission, Washington, D.C.

DETERMINATION OF FREE ACID IN PLUTONIUM, URANIUM AND THORIUM SOLUTIONS [BESTIMMUNG DER FREIEN SAEURE IN PLUTONIUM, URAN, UND THORIUM LOESUNGEN]

Helmut Schmieder et al [1969] 19 p refs Transl. into ENGLISH from Talanta, v. 16, 1969 p 691–700
(AEC-tr-7141) Avail: CFSTI

Since the actinides easily undergo hydrolysis, titration is performed in a nonaqueous system (2-propanol). Plutonium, uranium and thorium are precipitated as double salts by the addition of cesium chloride. Sodium ethoxide is used as titrant, with phenolphthalein serving as a visual indicator. A photometric titrator was also tested. Author (NSA)

N70-30396 National Lending Library for Science and Technology, Boston Spa (England).

MATHEMATICAL MODEL OF PERIODIC REDUCTION IN THE FLUIDIZED-BED ROASTING OF OXIDIZED NICKEL ORE

L. A. Danilin 6 Feb. 1970 8 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Tsvetn. Met. (Dzaudzhikau), v. 12, no. 3, 1969 p 151–159
(NLL-Trans-746-369-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

A working hypothesis of the mechanism of the reaction diffusion during the gas reduction of iron oxides was made for the mathematical model of the periodic reduction. The model is based on the following assumptions: The ore particles consist of iron oxide. The reaction takes place at the boundaries of the layer division of solid products of reaction. All the points of the reaction surfaces are accessible to the diffusing reagents. The grains of ore are spherical with similar radii. The initial stages of the reduction do not take place according to the diffusion mechanism and are quickly accomplished. During the construction of the material balance of solid products of the reduction, the iron oxide and the magnetite which form are calculated by the phases of the constant state. The temperature throughout a particle is constant. The changes of the physical state of the material during reduction are reflected by the appropriate changes in the coefficients of did diffusion and sections across which it takes place. Author

N70-30411# Army Foreign Science and Technology Center, Washington, D.C.

MECHANISM OF IONIZING-RADIATION ACTION ON SULFOCATIONS [O MEKHANIZME DEYSTVIYA IONIZIRUYUSHCHEGO IZLUCHENIYA NA SULFOKATIONITY]

P. E. Tulupov et al 13 Jan. 1970 17 p refs Transl. into ENGLISH from Russian Rept.

(AD-700348; FSTC-HT-23-141-70; J-7362) Avail: CFSTI CSCL 7/4

An investigation was made of the mechanism of the exchange capacity reduction in sulfopolystyrene cation exchangers during irradiation in water. Author (TAB)

N70-30414# Army Electronics Command, Fort Monmouth, N.J. Power Sources Div.

AN EQUIVALENT ELECTRIC CIRCUIT APPROACH TO THE STUDY OF HYDROCARBON OXIDATION KINETICS

Arthur A. Pilla and Gabriel J. Di Masi Feb. 1970 23 p refs

(AD-701173; ECOM-3220) Avail: CFSTI CSCL 7/4

The anodic oxidation of propane at a platinum electrode in 2F CF3COOH at 65C has been studied using an impedance technique. In this the response of the system to a potential controlled a.c. signal over the frequency range 10 Hz to 100 kHz was determined and related to an equivalent electric circuit which could be derived from a consideration of various possible mechanisms for the electrode reaction. Emphasis was placed upon the actual derivation of equivalent circuits and their relation to a specific physical process. The results show that, for the conditions of this study, the double layer capacitance could be evaluated in the presence of propane, and that adsorption is the predominant process in the initial stages of hydrocarbon oxidation. Author (TAB)

N70-30425 National Lending Library for Science and Technology, Boston Spa (England).

THE ELECTROLYTIC REFINING OF TUNGSTEN [ELEKTROLITICHESKOE RAFINIROVANIE VOL'FRAMA]

V. S. Balikhin et al 1969 12 p refs Transl. into ENGLISH from Met. Vol'frama, Molibdena i Niobiya (Moscow), 1967 p 166–172

(NLL-RTS-5521) Avail: Natl. Lending Library, Boston Spa, Engl.: 17s 6d or 2 NLL photocopy coupons

The refinement of tungsten waste by an electrolytic method using molten salts was studied to produce high purity tungsten in an inexpensive and speedy operation. The following electrolytes were investigated: chlorides, oxides, sodium tetraborate, and chloride-fluoride mixtures. It is concluded that the most promising electrolyte for refining tungsten is composed of a chloride-fluoride solution of KCl + 30% NaF and a phosphate solution of Na4P2O7. F.O.S.

N70-30446# Kernforschungsanlage, Juelich (West Germany). Zentrallabor fuer Chemische Analyse.

STANDARD INVESTIGATION METHODS FOR THE CHEMICAL ANALYSIS OF IRON AND STEEL, NONFERROUS METALS AND OTHER WORKING MATERIALS [STANDARD-UNTERSUCHUNGSMETHODEN ZUR CHEMISCHEN ANALYSE VON EISEN UND STAHL, NICHTEISENMETALLEN UND SONSTIGEN BETRIEBSSTOFFEN]

A. Klinkmann Sep. 1969 256 p refs In GERMAN

(JUL-613-CA) Avail: CFSTI

From the many available methods for the analysis of iron and steel, and non-ferrous metals, the simplest, fastest, and most reliable ones were chosen, and improved. In addition, new methods were devised. These standard investigation methods are precise and give results in agreement with classical ones. ESRO

N70-30454# Joint Publications Research Service, Washington, D.C.

OPERATION OF ELECTROLYTIC INSTALLATIONS FOR THE PRODUCTION OF HYDROGEN AND OXYGEN

A. B. Goldshteyn et al 21 May 1970 80 p refs Transl. into ENGLISH of the book "Ekspluatatsiya Elektroliznykh Ustanovok dlya Polucheniya Vodoroda i Kisloroda" Moscow, Energiya Press, 1969 p 1–89

(JPRS-50566) Avail: CFSTI

The operation of electrolytic installations for the production of hydrogen and oxygen is considered in terms of design and equipment specifications. Servicing, startup after installation or overhaul, and hydraulic layout of the electrolytic installation along with a brief discussion of the modern domestic and foreign installations are also considered. J.M.C.

N70-30456# Technische Hochschule Munchen (West Germany). Facultaet fuer Allgemeine Wissenschaften.

PH3: A NEW LIGAND IN TRANSITION METAL COMPLEX COMPOUNDS, SEPTEMBER 1967–OCTOBER 1969 [PH3: EIN NEUER LIGAND IN UEBERGANGSMETALL-KOMPLEX-VERBINDUNGEN, SEPTEMBER 1967–OCTOBER 1969]

Eckhart Louis (Ph.D. Thesis) 1969 69 p refs In GERMAN

Avail: CFSTI

The synthesis and isolation of stable transition metal PH3 complexes reveal a class of compounds which contain unsubstituted phosphine ligands with covalents due to double-bond sections of strengthened metal-PH3 bonds. The high capacity of PH3 to form complexes and its solubility in organic media are characterized and its bond ratio is investigated. Transl. by R.B.

N70-30486# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CHEMISTRY OF THE HALOID COMPOUNDS OF FLUORINE

N. S. Nikolaev et al 13 Jan. 1970 458 p refs Transl. into ENGLISH from Khim. Galoidnykh Soedinenii Ftora (Moscow), 1968 348 p

(AD-702974; FTD-HT-23-1370-68) Avail: CFSTI CSCL 7/2

The monograph is devoted to the fluorine compounds of chlorine, bromine and iodine. The methods of synthesis of the halogen compounds of fluorine and also their chemical and physicochemical characteristics are described and certain specific problems of the analytical chemistry of these compounds are discussed. Problems of the practical utilization of the halogen fluorides in the technology of atomic energy materials and in rocket engineering are also examined. Author (TAB)

N70-30520# Bureau of Mines, Amarillo, Tex. Helium Research Center.

VISCOSITY OF THE HELIUM-NITROGEN SYSTEM FROM 133 TO 740 K FOR PRESSURES BETWEEN 1 AND 240 ATMOSPHERES

Robert E. Wood and W. J. Boone, Jr. Jul. 1970 135 p refs

(BM-RI-7405) Avail: Issuing Activity

The temperature dependency of the low-density viscosity coefficients, of helium and of nitrogen, 100 to 1,000 K, is correlated with empirical equations. The temperature and composition dependencies of the low-density viscosity coefficients of helium-nitrogen mixtures are correlated with the Chapman–Enskog expressions by using the Lennard–Jones potential function. The residual viscosity was found to be a function of the thermal pressure coefficient, and two parameters, alpha and beta, which are characteristic of gas composition. The equation developed represent 1,340 higher pressure experimental viscosity values with a mean absolute deviation of 0.86 percent, and this equation was used to compute viscosities of the gaseous helium-nitrogen system for a range of temperatures and pressures including those encountered in Bureau of Mines helium purification processes and in a crude-helium conservation gas reservoir. Tabular viscosities for helium, nitrogen, and 13 helium-nitrogen mixtures are presented for 110 temperatures, 133 to 740 K, and 49 pressures in the range 1 to 240 atmospheres. Author

N70-30524# Deutsche Forschungs- und Versuchsansalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Luftstrahlantriebe.
EXPERIMENTAL DETERMINATION OF THE RATE OF DISSOCIATION OF FLUORINE IN A SHOCK TUBE [EXPERIMENTELLE BESTIMMUNG DER DISSOZIATIONSGESCHWINDIGKEIT VON FLUOR IN EINEM STOSSWELLENROHR]
Thomas Just and Gerhard Rimpel Jan. 1970 37 p refs In GERMAN; ENGLISH summary
(DLR-FB-70-02) Avail: CFSTI

In a shock tube the rate of dissociation of molecular fluorine was determined in a mixture of 10% F2 and 90% Ar in the temperature range of 1200 to 1500 K. Behind the incident shock wave the course of reaction was followed using the light absorption by the F2-molecules at a wavelength of 313 nm. Author

N70-30534# Keele Univ. (England). Dept. of Chemistry.
A PRELIMINARY STUDY WITH A DISCHARGE FLOW/SHOCK TUBE APPARATUS OF THE EMISSION FROM ACTIVE NITROGEN Final Report, 1 Apr. - 30 Jun. 1969
Peter Borrell, Alan Brittain, and Patricia M. Borrell Oct. 1969 16 p refs
(Contract F61052-68-C-0029)
(AD-702808; FR-ONR/1/4) Avail: CFSTI CSCL 7/4

The construction of a 2.5 cm diameter glow discharge shock tube is described. An outline is given of the expected behaviour of the yellow emission from combining nitrogen atoms when subjected to shock waves. Preliminary experiments show that the expectations are not fulfilled for there is a rapid increase in emission after the shock passes. The emission then diminishes rapidly. No interpretation is given as the effect is not yet understood; the work is still in progress. The remainder of the report gives the usual information on personnel, grants, publications etc. Author (TAB)

N70-30545# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CHROMATOGRAPHIC SEPARATION OF ISOMERIC PERFLUOROCHLOROBENZENES
S. V. Vitt et al 15 Aug. 1969 7 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Sibirskoye Otd. Izv., Ser. Khim. Nauk (USSR), no. 2, 1966 p 156 - 157
(AD-700794; FTD-HT-23-223-68) Avail: CFSTI CSCL 7/4

It was established that mixtures of isomeric dichlorotetrafluorobenzenes and trichlorotrifluoro benzenes could be completely separated and quantitatively analyzed by using steel capillary columns with polyproypleneglycol (PPG) or squalane (length 90 m, internal diameter 0.25 mm) at 70 and 100C, respectively. The separation was conducted on a gas chromatograph with a flame-ionization detector. Author (TAB)

N70-30546# California Univ., Livermore. Lawrence Radiation Lab.
CHANGES IN SOLVENT STRUCTURE AND LUMINESCENCE OF THE RIGID SOLUTIONS (T YIELDS S EMISSION AND RETARDED FLUORESCENCE)
Andre Martinez et al [1969] 17 p refs Transl. into ENGLISH from J. Chim. Phys., v. 66, 1969 p 817 - 824 Sponsored by AEC
(UCRL-Trans-10435) Avail: CFSTI

The variation of the mean life time of the T yields S emission of the solute as a function of time is studied to detect sudden variations of phosphorescence. It is concluded that the luminescence of rigid solutions indicates changes of the structure of solvents. The rearrangement of the solvent molecules produces a diffusion of excited molecules which leads to an extension of the emission of T yields S. F.O.S.

N70-30557# Fraunhofer-Gesellschaft, Garmisch- Partenkirchen (West Germany). Physikalisch-Bioklimatische Forschungsstelle.
DEVELOPMENT AND APPLICATION OF CHEMICAL METHODS AS A CONTRIBUTION TO THE SOLUTION OF COMPLEX RESEARCH PROBLEMS [ENTWICKLUNG UND ANWENDUNG CHEMISCHER METHODEN ALS BEITRAG ZUR LOESUNG KOMPLEXER FORSCHUNGSAUFGABEN]
Karl Poetzl *In its* Examples of Appl. Res. Jun. 1969 p 42 - 46 refs In GERMAN (See N70-30551 15-34)
Avail: CFSTI

Natural science research problems are often of a complex nature, and can only be solved by cooperation between several disciplines. The combination of physical and chemical methods for the following problems is discussed: analysis of fission products in fallout, determination of atmospheric beryllium 7, investigation of radioactive climate in underground areas, retention measurements of floating particles and industrial dust and their affects on human breathing, and determination of nitration in atmospheric precipitation and artificial ice crystals for atmospheric electricity research. ESRO

N70-30588# Dow Chemical Co., Golden, Colo. Rocky Flats Div.
A FORTRAN 4 PROGRAM FOR REDUCTION OF SPECTROPHOTOMETRIC REACTION KINETICS DATA
George J. Werkema 11 Mar. 1970 10 p ref
(Contract AT(29-1)-1106)
(RFP-1449) Avail: CFSTI

A program written in E-level FORTRAN IV for the IBM 360-40G computer for reduction of spectrophotometric reaction kinetics data is presented. The program reduces spectrophotometric absorbancy data to molar concentrations of reactants and products and, at the user's option, computes rate constant time products using the integrated forms of first-, second-, and third-order rate laws. Author (NSA)

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N70-29206 Pennsylvania Univ., Philadelphia.
INVESTIGATION OF THE OPTIMUM FREQUENCY ASSIGNMENT PROBLEM IN A SATELLITE SYSTEM
Mehmet Izzi Celebiler (Ph.D. Thesis) 1968 89 p
Avail: Univ. Microfilms: HC $4.60/Microfilm $3.00 Order No. 69-5614

In this work a constrained optimum assignment problem is defined and a procedure to find a low cost solution is given. The problem is that of assigning a smaller number of channels to a larger number of earth satellites so that interference at ground stations due to satellites other than the one being tracked is minimal. Three mathematical formulations of this problem are given. These problems are of general interest because they have numerous other applications. It is the first time that two of these problems are stated in the form they appear in this work. The probabilistic procedure is then developed to obtain a low cost solution, which may with finite probability be an optimum solution. Dissert. Abstr.

N70-29299 California Univ., Berkeley.
DYNAMIC COMMUNICATION NETWORKS
Mohammed Tawfik El-Bardai (Ph.D. Thesis) 1968 107 p
Avail: Univ. Microfilms: HC $5.40/Microfilm $3.00 Order No. 69-10285

Communication networks with link transit times are modeled by linear graphs with branch time delays and finite branch capacities. Memoryless linear routing strategies as well as linear routing strategies with finite memory are defined. The state reachability problem in both cases is considered, and the sets of reachable demand vectors are exhibited. The problem of finding optimal routings which minimize network losses subject to demand constraints is formulated as a linear program, and extensions to infinite memory and time varying systems are given. Satellite communications systems are examined from a graph theoretic point of view. The system is modelled as a bipartite graph. Stochastic inputs are assumed and time delay is the factor of interest. The model is formulated, routing and digital transmission schemes are described. The queueing problem is discussed for the single branch and for the satellite network cases. Approximate solutions are obtained for the case of satellites with finite memories. Dissert. Abstr.

N70-29491# Massachusetts Inst. of Tech., Cambridge. Center for International Studies.
RESEARCH PROGRAM ON PROBLEMS OF INTERNATIONAL COMMUNICATION AND SECURITY Final Report
Ithiel de Sola Pool Sep. 1969 140 p refs
(Contract AF 49(638)-1237; ARPA Order 427)
(AD-701103; C-69-26; AFOSR-70-0347TR) Avail: CFSTI CSCL 5/4

The main focus of the research has been on communications in the Soviet Union and China during crises, with some supplementary work on communications in other communist countries in the third world. The impact of the communications revolution was examined, especially the spread of radio in the process of modernization in developing countries and in the process of social change in the Soviet Union. The substitute system developed in China to achieve communication without major capital investment and subject to tight controls on information from the outside, was also examined. Author (TAB)

N70-29506# Lincoln Lab., Mass. Inst. of Tech., Lexington.
WATER-WAVE EFFECTS ON RADIO WAVE PROPAGATION IN THE OCEAN
Michael L. Burrows 2 Jan. 1970 18 p refs
(Contract AF 19(628)-5167)
(AD-700323; TN-1970-1; ESD-TR-70-1) Avail: CFSTI CSCL 17/2

A sinusoidal surface profile is used to study by an exact method the effect of water waves on an electromagnetic field propagating downwards from the surface. It is assumed that the magnetic field is directed parallel to the surface corrugations. The results are presented graphically. Comparisons are made between these results and those obtained using an approximate method of Wait. Author (TAB)

N70-29614*# California Univ., La Jolla. Dept. of Applied Electrophysics.
QUANTUM-MECHANICAL COMMUNICATION THEORY
C. W. Helstrom, Jane W. S. Liu (MIT, Cambridge), and J. P Gordon (Bell Telephone Labs., Holmdel, N.J.) [1970] 77 p refs
Prepared in cooperation with MIT, Cambridge and Bell Telephone Labs., Holmdel, N.J.
(Grants NGL-05-009-079; NGL-22-009-013)
(NASA-CR-86401) Avail: CFSTI CSCL 17B

The problem of finding the structure and performance of the receiver that yields the best performance in the reception of signals that are described quantum-mechanically is considered. The principles of statistical detection and estimation theory are discussed, with the laws of quantum mechanics taken into account. Several specific communication systems of practical interest are studied as examples of applying these principles. Basic concepts in quantum mechanics that are needed in these discussions are briefly reviewed. Author

N70-29749# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE NOISE IMMUNITY OF AN ELEMENTARY SIGNAL DURING PHASE-SHIFT KEYING
A. I. Volynkin 17 Oct. 1969 16 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Radiotekhn. (Kiev), v. 10, no. 4 p 370 377
(AD-700364; FTD-HT-23-313-68) Avail: CFSTI CSCL 9/4

Fluctuation noise may cause errors in the reception of phase-shift-keyed signals. The effect of noise level and clipping threshold (at the phase-detector output) on the probability of such errors is theoretically investigated. It is assumed that an additive Gaussian narrow-band noise is present at the IF-amplifier output. Formulas are derived for probabilities of spurious symbol, reversed (positive instead of negative or vice versa) symbol, and missing symbol. From these formulas, curves are plotted which show the above probabilities as functions of the signal-to-noise ratio and clipping threshold. The results are intended for designing phase-shift keying systems with erasing channel. TAB

N70-29751# California Inst. of Tech., Pasadena. Antenna Lab.
ANALYSIS OF APERTURE ANTENNAS IN INHOMOGENEOUS MEDIA
Dikran Damlamayan Nov. 1969 95 p refs
(Grant AF-AFOSR-1400-68)
(AD-700818; TR-52; AFOSR-69-2891TR) Avail: CFSTI CSCL 9/5

The object of this report is to calculate the admittance and the radiation pattern of aperture antennas fed by waveguides of arbitrary cross-section and radiating into dielectric slabs, whose constitutive parameters may be functions of position along the direction normal to the slab faces. For a given aperture field distribution the antenna aperture admittance and the radiation field are expressed here, for the first time, in terms of two auxiliary quantities directly related to the plane wave reflection and transmission coefficients of the dialectric slab. These quantities are the input admittance of the dielectric slab and the ratio of the total electric field amplitude transmitted at one end of the slab to the transverse field at the other, both calculated for plane waves as a function of incident propagation direction. This approach introduces a great simplification in the solution of the problem, particularly in the case of an antenna radiating into an inhomogeneous dielectric slab. A simple and powerful method has been devised for the computation of the input admittance of an inhomogeneous dielectric slab as well as for electric field ratio. In this case the impracticability of obtaining analytical results has necessitated the use of numerical techniques. Applications of theory are discussed. Author (TAB)

N70-29764# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE MILLSTONE HILL PROPAGATION STUDY
John V. Evans, ed. 26 Sep. 1969 96 p refs
(Contract AF 19(628)-5167)
(AD-701939; ESD-TR-69-306; TN-1969-51) Avail: CFSTI CSCL 17/9

Defensive radar systems for detecting and locating ballistic missiles must be designed to combat the degradation in system performance that can result from atmospheric and ionospheric refraction effects, clutter and scintillation. These phenomena become increasingly severe at low elevation angles and for high latitude stations there is a broad azimuthal sector where the effects are especially severe owing to the very irregular nature of the polar ionosphere and the presence of the aurora. A program of measurements and data analysis is in progress, primarily centered at the Millstone Hill radar facility, designed to evaluate tropospheric and ionospheric effects on radar measurements capability, with emphasis upon disturbed ionospheric conditions (e.g., when radio aurorae exist). Emphasis in these measurements will be on attempting to separate and characterize the ionospheric and tropospheric components of refraction and scintillation. In order to do this, a UHF lobe-comparison satellite-beacon tracking capability is being added to the precise L-band tracking radar at Millstone. This will permit simultaneous dual-frequency measurements of angle-of-arrival, amplitude and phase fluctuations for paths traversing the polar ionosphere as well as in other directions less subject to propagation effects. Author (TAB)

N70-29791*# Teledyne Ryan Aeronautical Co., San Diego, Calif. Electronic and Space Systems.

PHASED ARRAY STEP RECOVERY DIODE MODULES Final Engineering Report

Mar. 1970 50 p ref
(Contract NAS8-21408)
(NASA-CR-102723; Rept-29167-6) Avail: CFSTI CSCL 17B

Improvements in the transmitter efficiency by using transistors as power amplifiers following phase-controlled frequency multipliers, and phase stability of the amplifying and phase-controlling chain by close loop techniques were investigated. An array of seven modules was constructed, assembled, and tested to demonstrate array behavior using transistor amplifiers. The demonstration array was designed and constructed for laboratory tests with no product engineering involved. Author

N70-29795*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.

ANALYSIS OF A COMMUNICATION SATELLITE FOR LUNAR FAR-SIDE EXPLORATION

Jeffrey R. Kurland (M.S. Thesis) and Carl H. Goodwin (M.S. Thesis) Jun. 1970 314 p refs
(Grant NGL-22-009-019)
(NASA-CR-110355; CSR-T-70-1) Avail: CFSTI CSCL 22B

The feasibility and conceptual design of a communication satellite which provides a real-time, two-way communications link between the Earth and a spacecraft located behind the Moon is presented. This satellite is capable of relaying color television, voice, high-bit-rate telemetry data, and ranging code from the Command and Service Module and the Lunar Module during all phases of their mission. The 905-pound satellite has a useful lifetime of four years and is envisioned for launch in the 1973-74 period via a thrust augmented thor-delta vehicle. A lunar fly-by trajectory places the satellite behind the Moon in a bounded 3500 kilometer radius halo orbit about the Earth-Moon L sub 2 libration point. This halo orbit affords the satellite a continuous view of both the Earth and the entire lunar back side. However, due to the instability of this orbit, periodic orbit corrections are performed by a set of special thrusters. Author

N70-29820*# Alabama Univ., University. Bureau of Engineering Research.

Am-BASEBAND TELEMETRY SYSTEMS. VOLUME 2: CARRIER SYNTHESIS FROM AM MODULATED CARRIERS

William H. Tranter Jun. 1969 60 p refs
(Contract NAS8-20172)
(NASA-CR-102494; TR-103-102-Vol-2) Avail: CFSTI CSCL 09F

An analysis of coherent demodulation in a DSB/FM telemetry system, having demodulation carriers synthesized from the modulated data-signal zero crossings, is performed. The analysis concerns the perturbing effects of both tape recorder flutter and noise on various system elements. These perturbations are reflected into system error by consideration of demodulation phase errors. Author

N70-29831# Akademiya Nauk URSR, Kiev.

DATA COLLECTION AND TRANSMISSION, NO. 18 [OTBOR I PEREDACHA INFORMATSII, VYPUSK 18]

1968 132 p refs In RUSSIAN
Avail: CFSTI

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17. STATIC TRIGGER CIRCUITS WITH STANDARDIZED DYNAMIC ELEMENTS Yu. D. Bakulin p 125–128 (See N70-29848 15-09)

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N70-29832# Akademiya Nauk URSR, Kiev.

ADAPTIVE CODING METHOD

B. A. Popov, A. N. Svenson, and N. T. Tynnaya *In its* Data Collection and Transmission, No. 18 1968 p 7–15 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

The effectiveness of adaptive coding is analyzed for telemetering in quasistationary modes in terms of its efficiency for micromodes. Assuming an information flow transmitted in a finite sum of micromodes, expressions are derived for the relative increase in effectiveness. The effectiveness increases in proportion to the probability variation of the discrete data in a given mode. Transl. by B.E.S.

N70-29833# Akademiya Nauk URSR, Kiev.

ON THE QUESTION OF EVALUATING THE AMOUNT OF APPLIED INFORMATION FOR CORRECTING CODES

V. V. Gritsyk *In its* Data Collection and Transmission, No. 18 1968 p 16-26 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

Theoretical bases for error detection and correction in coded transmissions are reviewed. The general case of an m-based code language is treated, and specific cases of binary coding error (m-2) are given. Expressions are derived for the probability of decoding error for several assumed coding languages. The analysis can be used to determine the relative advantage of an error correcting over an error detecting code for a given transmission problem.
Transl. by B.E.S.

N70-29834# Akademiya Nauk URSR, Kiev.

INCREASING THE BANDPASS CAPABILITIES OF A STATISTICAL MULTIPLEXING SYSTEM

L. A. Nikiforova and G. A. Pushchin *In its* Data Collection and Transmission, No. 18 1968 p 27-30 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

The feasibility of increasing the data-handling capacity of a multichannel transmitting system by selective addressing is investigated. The analysis reduces to a determination of the maximum fraction of signals for which address data are not needed during a given transmission interval. A fixed number of input channels with no overloading is assumed. The proposed method is shown to be governed by a probability function, dependent on the number of signal sources and commutating channels available.
Transl. by B.E.S.

N70-29835# Akademiya Nauk URSR, Kiev.

COMPARATIVE ANALYSIS OF METHODS OF DATA TRANSMISSION OVER A STATISTICALLY MULTIPLEXED SYSTEM

L. A. Nikiforova and G. A. Pushchin *In its* Data Collection and Transmission, No. 18 1968 p 31-38 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

Theoretical approaches are analyzed for obtaining optimum forms of multiplexed signal transmission. The problem is shown to reduce to statistical time-sharing in which the relative probabilities of data transmission duration in terms of pause interval duration must be evaluated. This yields the expected level of lost data or address information due to overlap of the multiplex intervals.
Transl. by B.E.S.

N70-29836# Akademiya Nauk URSR, Kiev.

EXPERIMENTALLY EVALUATING THE EFFECTIVENESS OF PARALLEL TRANSMISSION OF PULSED SIGNALS OVER REMOTE MULTICHANNEL SYSTEMS

N. T. Tynnaya and A. N. Svenson *In its* Data Collection and Transmission, No. 18 1968 p 39-46 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

Experiments designed to identify and overcome noise problems in long-distance telephone transmission lines are described. Redundant transmission over two or more lines simultaneously and auxiliary transmission over a separate non-multiplexed line were tested. A four channel two-way link from L'vov to Kiev was used, a total distance of 1140 km. Parallel transmission was shown to be effective in noise rejection, provided that one channel is limited to a single frequency band. A dummy channel method proved ineffective.
Transl. by B.E.S.

N70-29837# Akademiya Nauk URSR, Kiev.

REPRESENTATION OF POSITIVELY-DETERMINED KERNELS AND THE PROBLEM OF SHAPING FILTERS

Ya. P. Dragan *In its* Data Collection and Transmission, No. 18 1968 p 47-56 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

Design criteria are given for a general class of filters from which a random process is obtained which is represented by a continuous spectral function. Assuming a positively determined kernel, the possibilities of using alternative spectral methods in analyzing a generally nonstationary random process are examined. Theorems for establishing pulse characteristics of the required shaping filter are proven.
Transl. by B.E.S.

N70-29838# Akademiya Nauk URSR, Kiev.

NARROWBAND DISCRETE FILTERS

Yu. M. Korshunov and A. I. Stephashkin *In its* Data Collection and Transmission, No. 18 1968 p 57-64 ref In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

Theoretical advantages of narrowband discrete filters are reviewed. The filters are assumed to be continuously tunable over a given design frequency range, and have both limited and unlimited duration of transient processes. Inherent disadvantages of these filter types are cited, and means of minimizing them are suggested. The discrete filter with unlimited transient duration is prepared, since it requires less memory capacity than the limited-transient type.
Transl. by B.E.S.

N70-29839# Akademiya Nauk URSR, Kiev.

ON THE EQUIVALENCE OF DIGITAL RIPPLE FILTERS WITH LIMITED AND UNLIMITED TRANSIENT DURATIONS

A. I. Bobikov and L. A. Emikh *In its* Data Collection and Transmission, No. 18 1968 p 65-68 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

Limited-transient and unlimited-transient digital filters are compared with respect to their smoothing properties. A particular noise correlation function is assumed. Discrete values of signal and noise are also assumed to be mutually independent. Graphical data are presented showing relative variation in smoothing coefficients. It is concluded that there is negligible difference in filtering behavior for the two filter types.
Transl. by B.E.S.

N70-29840# Akademiya Nauk URSR, Kiev.

AN OPTIMUM FILTER FOR A SPACE SIGNAL

B. A. Popov *In its* Data Collection and Transmission, No. 18 1968 p 69-73 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

Expressions are derived for the parameters of an optimal space signal filter, assuming the idealized case of additive stationary random noise being present. The analysis is directed toward character recognition, expressed in terms of background noise, image brightness, and filter bandpass. It is shown that to obtain maximum signal-to-noise ratios the filter bandpass must lie within a definite range: an expression for finding this limiting condition is given.
Transl. by B.E.S.

N70-29841# Akademiya Nauk URSR, Kiev.

CYLINDRICAL LENS APPLICATION AS A TWO-DIMENSIONAL ANISOTROPIC FILTER

A. A. Smerdov and G. D. Fedorchenko-tikhiy *In its* Data Collection and Transmission, No. 18 1968 p 74-81 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

The possibility is investigated of using a cylindrical lens as an astigmatic two-dimensional filter for a point-source signal, for RF applications such as video signal filtering. Cylindrical lens geometries and their orientations relative to an assumed point-source signal are treated, and expressions for filtered image distributions are given. Practical uses for such filters in RF applications are cited, including multiplication, integration, generation of Laplace transforms, and others. Transl. by B.E.S.

N70-29844# Akademiya Nauk URSR, Kiev.

MEAN NUMBER OF ENVELOPE, PHASE AND FREQUENCY CROSSINGS

M. G. Bilyk *In its* Data Collection and Transmission, No. 18 1968 p 98-104 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

A combined sinusoidal signal and normally-distributed random noise are examined. Probability expressions are derived in terms of zero-crossings of a constant or variable reference level. The variables considered with respect to zero-crossings are signal envelope, phase, and frequency. Theorems for the mathematical expectancy of these three variables are proven. Transl. by B.E.S.

N70-29845# Akademiya Nauk URSR, Kiev.

A STUDY OF AMPLITUDE LIMITING IN A FREQUENCY-MONDULATED PHOTOTELEGRAPHIC SIGNAL

Yu. Ya. Shats and A. Ya. Schramkov *In its* Data Collection and Transmission, No. 18 1968 p 105 - 109 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

Amplitude limiting of a photo-FM signal is analyzed in terms of signal modulation and receiver characteristics. An approximate expression is derived for signal spectrum at the limiter output, which is valid for reasonably small deviations in signal and carrier frequency. Since the latter conditions normally apply in photo-FM transmission, the derived formula is considered to be generally applicable for design use. Transl. by B.E.S.

N70-29846# Akademiya Nauk URSR, Kiev.

ANALYSIS OF ERROR IN THE OVERALL SPECTRUM OF AN FM SIGNAL

Yu. Ya. Shats *In its* Data Collection and Transmission, No. 18 1968 p 110 - 112 ref In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

While FM telemetry systems customarily use a symmetrically limited FM spectrum, analyses of system operation usually treat the signal as having an unbounded spectrum, which leads to a determinable error. Expressions are developed for evaluating this error, in terms of carrier and modulating frequencies, with an FM index of less than one assumed. The minimum number of harmonics which should be included in the limited spectrum, such that a given level of error will not be exceeded. Transl. by B.E.S.

N70-29847# Akademiya Nauk URSR, Kiev.

A NONLINEAR SIGNAL CONVERSION SYSTEM FOR ACOUSTICAL CORING

I. I. Blazhkevich, V. P. Bodunov, and V. V. Dakhnov *In its* Data Collection and Transmission, No. 18 1968 p 113 - 124 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

A transistorized receiver for ultrasonic coring signals is described and circuit schematics are given. The acoustic signal converter is nonlinear, with greater amplification applied to lower-level input signals. Negative feedback by means of thermistors is provided, which enables circuit operation at temperatures up to 120 C with errors no higher than + or - 5%. Conversion response is linear for operating frequencies up to 30 kHz. Transl. by B.E.S.

N70-29862 National Lending Library for Science and Technology, Boston Spa (England).

TECHNIQUES AND PROBLEMS IN THE EVALUATION OF RADAR CROSS-SECTIONS OF FREE FLYING BIRDS [METHODEN UND PROBLEME DER BISTIMMUNG VON RADARQUERSCHNITTEN FREI FLIEGENDER VOEGEL]

B. Bruderer et al 28 Jan. 1970 17 p refs Transl. into ENGLISH from article presented at Ann. Meeting of the Swiss Sci. Res. Soc., St. Gallen, Switz., 4 Oct. 1969
(NLL-RRE-Trans-265-(8036.625)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Radar back scattering cross sections of free flying birds permit approximate determination of the size of the flock or of the individual bird and is of interest in prevention of damage to air traffic by birds. Radar studies supply the scientific radar ornithologist with information about the quota of different target dimensions in a random sample of echoes and create prerequisites for analysis of flight densities in various distance ranges. Author

N70-29896# Army Electronics Command, Fort Monmouth, N.J.

THE CONSONANT RECOGNITION TEST

John W. Preusse Dec. 1969 112 p refs
(AD-701916; ECOM-3207) Avail: CFSTI CSCL 17/2

A new test of speech intelligibility called the Consonant Recognition Test was developed and evaluated. Designed to use human subjects in conjunction with a digital computer as a precision laboratory tool for diagnostic analysis of speech communication systems, this test appears to combine the attributes of simplicity, efficiency of testing, sensitivity and diagnostic ability to an extent not previously attained by intelligibility tests. To minimize the effects of speaker differences and conveniently permit the use of a large number of speakers, nine speakers were rotated or multiplexed in the recorded version of the test lists, so that each list contained a sample of the nine voices. The report describes the test, the source tape, the test analysis computer program, experiments relating this test to others in wide usage and a detailed example of the proper application of the test. Author (TAB)

N70-29920*# Texas Univ., Austin. Electrical Engineering Research Lab.

ELECTRICAL ENGINEERING RESEARCH LABORATORY Third Quarterly Progress Report, 1 October - 31 December 1969

Dec. 1969 68 p refs
(Grant NGL-44-012-006)
(NASA-CR-110225; QPR-3) Avail: CFSTI CSCL 20N

CONTENTS:

1. ASTRONOMICAL REFRACTION AT MILLIMETER WAVELENGTHS J. H. Davis and J. R. Cogdell 15 p refs (See N70-29921 15-07)

2. TIME DEPENDENT VARIATIONS IN SKY EMISSION TEMPERATURES AT MILLIMETER WAVELENGTHS. ANOMOLOUS SKY TEMPERATURE VARIATION WITH ZENITH DISTANCE MEASURED AT A CALM NIGHT AT A WAVELENGTH OF 3.2 mm. MEASUREMENTS OF LINEAR POLARIZATION OF THE MOON AT MILLIMETER WAVELENGTHS T. Yamashita (Nagoya Univ., Japan) p 1 - 52 refs (See N70-29922 15-13)

N70-29921*# Texas Univ., Austin.

ASTRONOMICAL REFRACTION AT MILLIMETER WAVELENGTHS

John H. Davis and John R. Cogdell *In its* Elec. Eng. Res. Lab. 3d Quart. Progr. Rept. Dec. 1969 15 p refs (See N70-19920 15-07)
Avail: CFSTI CSCL 20N

The antenna calibration program included measurements at millimeter wavelengths, differential refraction between optical and radio frequency waves as they pass through the atmosphere. A large number of data sets were obtained to measure sag and opacity, but only a few of these were carried to elevation angles which were low enough to allow accurate evaluation of differential refraction. Meteorological data are tabulated, and a formula is derived for radio refractive index. Results exhibit the expected geometrical and meteorological dependencies. E.M.C.

N70-30012# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A MULTI-LEVEL PHASE CONTINUOUS FSK MODULATOR
Michael P. Mullo 10 Nov. 1969 33 p refs
(Contract AF 19(628)-5167)
(AD-702099; TN-1969-58; ESD-TR-69-334) Avail: CFSTI CSCL 17/2

A phase continuous FSK modulator has been instrumented using digital techniques. The system allows for the selection of operating modes using multi-frequency level operation along with variable signaling rates. The principal feature of this modulation technique is its property of yielding a spectrum with a narrower bandwidth than conventional FSK at a given keying rate. Author (TAB)

N70-30090*# Computer Sciences Corp., Falls Church, Va. Geonautics Operation.
ANALYSIS OF ANGULAR ALIGNMENT PROCEDURES FOR UNIFIED S-BAND 30-FOOT ANTENNA SYSTEM
Mar. 1970 130 p refs
(Contract NAS5-10854)
(NASA-CR-110342) Avail: CFSTI CSCL 17B

Field tests and analytical studies were made to define an appropriate error model for using star observations to calibrate the mechanical axis of the antenna. A star calibration model was developed. This included nine error terms for defining antenna misalignment due to angle encoder bias, azimuth misalignment, tilt with respect to the local gravity vector, and nonorthogonalities of the X axis to Y axis, and optical axis to Y axis, and X and Y structural deflections. It was found that the Y-wheelhouse spirit levels provide a reliable means of monitoring antenna change between sets of star observations, and that optical targets are useful in supporting evidence of change. Tests conducted on the standard boresighting technique indicated that, despite multipath, optical-rf alignment can be determined by this technique. Preliminary testing and analysis was made to determine the feasibility of using celestial radio sources and the ALSEP transponder for RF axis alignment. Author

N70-30105*# National Aeronautics and Space Administration. Electronics Research Center, Cambridge, Mass.
CHARACTERISTICS OF MAGNETOSPHERIC DUCTS OBSERVED BY THE ALOUETTE-2 TOPSIDE SOUNDER
J. Ramasastry and E. J. Walsh Washington Jun. 1970 211 p refs
(NASA-TN-D-5847; C-107) Avail: CFSTI CSCL 17B

Results on the physical characteristics of magnetospheric dusts with reference to their scale-sizes and peak fractional deviations of electron density are presented. More than 400,000 Alouette-2 ionograms have been analyzed to study the conjugate ducting phenomenon. A select sample of data is used to decipher the duct characteristics. The calculated average values for the scale sizes and peak fractional deviations of electron density are in agreement with the previously published results for the Explorer-20 and Alouette-1 topside sounder data. Author

N70-30149# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MODERATE COST UHF SATELLITE COMMUNICATIONS WITHOUT EXCLUSIVE FREQUENCY ALLOCATIONS
Irwin L. Lebow, Charles W. Niessen, and Thomas S. Seay 3 Dec. 1969 16 p
(Contract AF 19(628)-5167)
(AD-702100; TN-1969-61; ESD-TR-69-383) Avail: CFSTI CSCL 17/2

Although UHF (225-400 MHz) operation can provide relatively low-cost satellite communications, the exclusive frequency allocations necessary for very simple systems almost certainly cannot be obtained. In this note a scheme is described which alleviates this problem, allowing co-existance between the current line-of-sight users of the UHF band and potential satellite users equipped with relatively inexpensive terminals. Author (TAB)

N70-30165# Oslo Univ. (Norway). Inst. of Physics.
INFORMATION IN A PHOTON BEAM VERSUS MODULATION LEVEL SPACING
Ellen Hisdal [1969] 25 p refs *Its* Paper No. 1
Avail: CFSTI

The case of a photon beam reflected from a set of s samples with equal reflectance spacing is studied. It is applied to the problem of computing the amount of information transmitted via a photon beam which is intensity modulated in s equal, discrete steps from a given maximum expected photon number k sub max and down to a given minimum k sub min. Maximum information is obtained with a sample number which is such, that the difference delta k in the expected number of reflected photons from successive samples is about 2.7 times the rms fluctuation in k sub max. The reliability of this maximum information i sub m is about 0.8 i sub m is very nearly a function of the single parameter c = (k sub max - k sub min) /square root of k sub min. These results hold provided that the rms fluctuation of k sub max is not too different from that of k sub min. For k sub min = 0, maximum information is obtained with a somewhat smaller spacing delta k and its reliability is about 0.61 for k sub max > or = 20. If the temporal or spatial resolution of the system can be varied, it is found that k sub max of the order of 5, and on-off signal modulation are the most favorable condition for high information transmission combined with low complexity of coding. Author

N70-30166# Oslo Univ. (Norway). Inst. of Physics.
INFORMATION AND ENTROPY IN COMMUNICATION AND MEASUREMENT
Ellen Hisdal [1969] 16 p refs *Its* Paper No. 2
Avail: CFSTI

The quality of a measurement is described by its information content, accuracy and reliability. Reliability is defined as the ratio between mutual and a priori information. In the communication case accuracy is related to efficiency of information transmission and reliability to complexity of coding. The difference between measuring the instantaneous value of a fluctuating quantity and the expected value of a quantity is pointed out. The first type of measurement is directly connected with the thermodynamic entropy of the fluctuating system. In the second type of observation the necessary entropy increase of the universe due to the measurement increases with the required accuracy and reliability. Author

N70-30200# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MOTION PICTURE AND TELEVISION ENGINEERING (SELECTED ARTICLES)
29 Dec. 1969 39 p refs Transl. into ENGLISH from Tekhn. Kino i Televideniya (Moscow), v. 13, no. 3, 1969 p 39-42, 43-47, 68, and 73-74
(AD-703173; FTD-MT-24-348-69) Avail: CFSTI CSCL 17/2

Contents: The process of accumulation in a vidicon; Control of interlaced scanning in television cameras; Kiev-16-E movie camera; and At the television centers. TAB

N70-30208# British Aircraft Corp. (Operating) Ltd., Bristol (England).
THE FUTURE USE OF PCM TELEMETRY IN SOUNDING ROCKETS
T. T. Walters *In its* Brit. Interplanet. Soc. Sounding Rocket Symp.: Contrib. by the Brit. Aircraft Corp. Apr. 1970 22 p (See N70-30202 15-31)
(ESS/SS-38/5) Avail: CFSTI

Sounding rocket telemetry systems and their limitations are reviewed. PCM data transmission from satellites is described and the Concorde aircraft PCM data recorder is considered in detail. Proposals for adapting a PCM high speed train telemetry system for sounding rocket use is discussed. ESRO

N70-30212# Royal Radar Establishment, Malvern (England).

A STUDY OF GROUND CLUTTER USING A 10 cm SURVEILLANCE RADAR

M. P. Warden and B. A. Wyndham Sep. 1969 33 p refs
(RRE-TN-745) Copyright. Avail: CFSTI

This note gives some results of a study of ground clutter at grazing incidence using a 10 cm surveillance radar. The digitized amplitudes of the clutter signals were processed in a computer to produce probability distributions of the clutter radar cross-section. A clutter map of the area of interest describing the clutter echo in terms of the median cross-section and interquartile range of each resolution cell was made. Probability distributions of clutter cross-section fluctuations with a rotating aerial operating at two different pulse lengths (10:1) were computed. Author (ESRO)

N70-30221# Siemens A. G., Munich (West Germany).

COMMUNICATIONS SATELLITE. VOLUME 1: OVERALL PLANNING AND SYSTEM INVESTIGATIONS [NACHRICHTENSATELLIT: BAND 1: GESAMTPLANUNG UND SYSTEMUNTERSUCHUNGEN]

R. John, F. Kuehne, F. Muenzel, and A. Vlcek Apr. 1970 107 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-W-70-12) Avail: CFSTI; Zentralstelle fuer Luftfahrtdokumentation und Inform. (ZLDI), Munich: 22 DM

A description is given of the universally applicable transponders of a communications satellite, which are compatible with the global system of COMSAT. The satellite has two 225 MHz wide transponders, which translate communications signals from the receiving frequency range (5925 to 6425 MHz) via an intermediate frequency range (250 to 750 MHz) into the transmitting frequency range (3700 to 4200 MHz). The signal path, the carrier supply, the remote control, and remote measuring system of the transponders are described; the reliability block diagram of the double transponder is also shown. The special problems of system calculations, square-law demodulation of remote control signals, group delay measurements, intelligible crosstalk, and reliability calculation are dealt with in the annexes. Author (ESRO)

N70-30258# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

RESOLUTION THEORY FOR AN IDEAL PICKUP TUBE

B. V. Titkov 30 Jan. 1970 10 p refs Transl. into ENGLISH from Tekhn. Kin. i Televideniya (Moscow), v. 11, no. 12, 1967 p 37 41
(AD-703015; FTD-HT-23-349-69) Avail: CFSTI CSCL 17/2

A statistical communication theory is applied to the problem of determining threshold characteristics in ideal pickup tubes, making it possible to define more precisely and broaden the meaning of classical fluctuation formulas. The expressions derived reflect a clear quantitative connection between basic parameters in detection and resolution problems. This theory can serve as a basis for developing automatic methods and devices for the objective study of the effect of real television devices on resolving power. TAB

N70-30259# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MOTION PICTURE AND TELEVISION ENGINEERING, VOLUME 12, NO. 4 (SELECTED ARTICLES)

A. N. Afanasev et al 28 Jan. 1970 15 p refs Transl. into ENGLISH from Tekhn. Kino i Televideniya (Moscow), v. 12, no. 4, 1968 p 33 42
(AD-703014; FTD-HT-23-348-69) Avail: CFSTI CSCL 17/2

Contents: The automatic optical focusing of a television camera; The influence of the operating mode of a vidicon on its resolving power. TAB

N70-30269# Lincoln Lab., Mass. Inst. of Tech., Lexington.

COMPUTER GENERATED SPEECH SPECTROGRAMS

Alan V. Oppenheim 28 Nov. 1969 17 p refs
(Contract AF 19(628)-5167)
(AD-701020; TN-1969-55; ESD-TR-69-352) Avail: CFSTI CSCL 20/1

One of the early applications of the fast Fourier transform was in spectral analysis of speech waveforms, and it was immediately evident that, at least in principle, speech spectrograms could be generated by computer using the FFT. In the note the procedure and results of such an experiment are presented. Author (TAB)

N70-30276# Saarland Univ., Saarbrucken (West Germany). Mathematisch-Naturwissenschaftliche Fakultaet.

THE BACKSCATTER RADIATION OF A SPHERE WITH INFINITE CONDUCTIVITY, EMBEDDED IN A DIELECTRIC SEMIINFINITE BODY NEAR ITS SURFACE [UEBER DIE RUECKSTRAHLUNG EINER IN EINEM DIELEKTRISCHEN HALBRAUM IN DER NAEHE VON DESSEN OBERFLAECHE EINGEBETTETEN UNENDLICH LEITENDEN KUGEL]

Jean Wiedemann (Ph.D. Thesis) 1 Mar. 1969 123 p refs In GERMAN
Avail: CFSTI

An infinitely conducting sphere embedded in a dielectric half space near the plane surface, with air above the surface, was considered. An incident electromagnetic wave gives rise to a wave reflected from the upper half space from the dielectric half space, and also to scattered radiation in the air space, due to reflection at the sphere. The directional dependence of the scattering cross section of the sphere with fixed incident angle of the primary wave was calculated. Author (ESRO)

N70-30284# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

METHODS OF INCREASING RESOLUTION IN A PULSE RADAR

Wen-Pin Tsao 17 Dec. 1969 17 p refs Transl. into ENGLISH from Tien-Tzu Chi-Shu (Shanghai), no. 6, 1964 p 30 33
(AD-703010; FTD-HT-23-180-69) Avail: CFSTI CSCL 17/9

The author discusses methods of improving resolution at pulse radar stations by analyzing factors affecting radar performance. The distance equation is extended to cover the expression for the maximum received information, taking into account receiver principles, maximum number of detectable targets, and parabolic antenna theories discussed by A. P. Dorokhov. The author concludes that millimeter and micron waves can be used to obtain high resolution. The method of pulse compression is proposed for use in simultaneously raising resolution and broadening detection ranges. TAB

N70-30316# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SYSTEMS OF CONTROL AND REGULATION: SELECTION OF ARTICLES [SISTEMY UPRAVLENIYA I KONTROLYA]

V. V. Dubnitskii et al 22 Oct. 1969 29 p refs Transl. into ENGLISH from Akad. Nauk SSSR. Inst. Elektromekhan. (Leningrad), 1968 12 p
(AD-700704; FTD-HT-23-306-69) Avail: CFSTI CSCL 17/2

Contents: The designing of data-transmission systems; An error recording device for discrete information transmission channels; and Formation of high-frequency channels of transmission of information over high-voltage cable lines. TAB

N70-30343# Atlantic Research Corp., Alexandria, Va. Jansky and Bailey Engineering Dept.

MULTI-BAR ROTOR DOPPLER VOR DISTRIBUTOR Final Report
Charles E. Greeley Mar. 1970 77 p
(Contract FAA-ARDS-560)
(FAA-RD-69-68) Avail: CFSTI

A brief history of distributor development is given. The requirements and problems to overcome in the development of a distributor having an output of the form Y = sin pi x/pi x and having two input channels are discussed. Developments procedures of the many methods suggested are described, together with pictures of the prototypes built and tested. Results of the laboratory tests, ground tests and flight tests are presented and discussed. Author

N70-30344# Weapons Research Establishment, Adelaide (Australia).
THE SPATIAL ATTENUATION OF HF RADIO WAVES IN THE IONOSPHERE
P. L. George Oct. 1969 18 p refs
(TN-CPD-166) Avail: CFSTI

The spatial attenuation of an hf radio wave travelling within a refracting ionosphere is considered. Under the assumptions of an isotropic concentric ionosphere an expression for the signal intensity at a remote point is derived. A graphical construction (a reflectrix) is used to demonstrate a defocussing mechanism, the existence of which has been experimentally verified with the aid of oblique pulse amplitude experiments carried out over an 1894 kilometre path during the winter of 1967. Author

N70-30348# Joint Publications Research Service, Washington, D.C.
EFFECTIVENESS ANALYSIS OF MOVING TARGET SELECTION SYSTEMS BY COMPUTER MODELING
V. A. Likharev et al 3 Jun. 1970 3 p refs Transl. into ENGLISH from Radiotekhn. (Moscow), no. 4, 1970 p 99-101
(JPRS-50652) Avail: CFSTI

In making comparative analyses of moving target selection systems on a background of correlated noises on the basis of the magnitude of threshold signals, the difficulty of obtaining manageable analytical relationships requires the use of digital computers. Techniques are presented for determining the detection characteristics of moving target selection systems by using algorithmic computer computation methods and statistical modeling by the Monte Carlo method. Author

N70-30357# Human Resources Research Organization, Alexandria, Va.
DETERMINATION OF GROUND-TO-AIRCRAFT DISTANCE BY VISUAL TECHNIQUES
Robert J. Foskett Dec. 1969 50 p refs
(Contract DAHC19-70-C-0012)
(AD-701151; HUMRRO-TR-69-22) Avail: CFSTI CSCL 19/5

As part of research to develop techniques for use in the training of range estimation, the accuracies of two visual methods of determining specific ground-to-aircraft distances were compared. Using the Flyover method, training assistants signaled when the aircraft flew over markers placed at known distances from the training site. Using the Range Sight method, training assistants used a ranging device similar to a protractor to indicate when an aircraft passed each of several reference markers corresponding to known distances and angles from the training site. Comparison of the accuracy of each visual method with radar measurement of the aircraft position was made. Author (TAB)

N70-30380# Max-Planck-Institut fur Aeronomie, Lindau uber Northeim (West Germany).
AN ALTIMETER/TELEMETRY SYSTEM FOR SMALL SOUNDING ROCKETS
H. U. Widdel and G. Rose 1970 4 p Presented at the Brit. Interplanet. Soc. Symp. on Sounding Rockets, Cardiff, UK, Apr. 1970
Avail: CFSTI

Simulation and balloon tests of a telemetry system which periodically switches from the data transmission mode to a radio altimeter mode are described. The system is destined for use in Skua 2 payloads launched from German ships in order to avoid using radar tracking. L band frequencies are likely to be used. ESRO

N70-30415# Goodyear Aerospace Corp., Litchfield Park, Ariz.
PREDESIGN DATA FOR THE RADAR STEREO EQUIPMENT PROGRAM Interim Report
F. F. Miranda Aug. 1969 63 p
(Contract DAAK02-69-C-0265)
(AD-701169; GERA-1500; IR-1) Avail: CFSTI CSCL 17/9

The report describes the progress made during the first phase of the radar stereo equipment program. During this phase an analytical approach to stereo plotting was selected and a preliminary design of the equipment was developed. The selected approach involves a stereo comparator for making measurements on the imagery, a general purpose computer to transform image coordinates to map coordinates, and a digital plotter to plot the map contours. Also, a set of equations describing the stereo model was derived and an analysis performed. Author (TAB)

N70-30432*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
L-BAND PERFORMANCE CHARACTERISTICS OF THE ATS 5 SPACECRAFT
Frederic Kissel May 1970 87 p Revised
(NASA-TM-X-63828-Rev; X-731-70-51-Rev.) Avail: CFSTI CSCL 17B

The results are summarized of initial L-band experimentation utilizing NASA's Applications Technology Satellite ATS-5 and the STADAN ground station located near Barstow, California. Experimentation was performed over a three month period to determine the spacecraft performance characteristics and to perform limited propagation tests. Included in the report are appendices containing information concerning propagation effects as well as measurement techniques. Author

N70-30448# Technische Hochschule Munchen (West Germany).
ERGONOMIC STUDIES OF VARIOUS PARAMETERS ON THE ORIENTATION ABILITY OF RADAR OPERATOR DURING AIR SURVEILLANCE OPERATIONS [ERGONOMISCHE UNTERSUCHUNGEN UEBER DEN EINFLUSS VERSCHIEDENER PARAMETER AUF DIE ORTUNGSLEISTUNG DES RADARBEOBACHTERS BEI AUFGABEN DER LUFTRAUMUEBERWACHUNG]
Peter Schmucker (Ph.D. Thesis) Dec. 1969 217 p refs In GERMAN
Avail: CFSTI

The ability of the radar observer to detect all illuminated returns on the screen is investigated. Three plotting techniques used to move the marker are compared: a joystick, a rolling ball, and a free-moving plotting pen. Also the effect of operating time, the number of objects, a new plotting scheme are investigated. The speed and accuracy of the plots, the performance of the operator, and the spatial distribution of the plots on the screen are measured, calculated, and analyzed statistically. The studies show that the plotting pen is easiest to manipulate, while the rolling ball is most accurate. Transl. by R.B.

N70-30460# Deutsche Versuchsanstalt fur Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.

THE REFLECTION DIAGRAM OF A SPHERE OF INFINITE CONDUCTIVITY COVERED WITH REFLECTION DIMINISHING LAYERS [DAS RUECKSTRAHLDIAGRAMM EINER MIT EINER REFLEXIONSMINDERNDEN SCHICHTUNG UMMANTELTEN UNENDLICH LEITENDEN KUGEL]
Dieter Glesner (Ph.D. Thesis—Saarland Univ., 3 Feb. 1965) Saarbrucken, West Ger. Saarland Univ. 1966 97 p refs In GERMAN
Avail: CFSTI

The influence (reflection and diffraction) of a covered ideally conducting sphere on the radiation field of a horizontal Hertzian dipole was investigated, including the suppression of backward radiation. The moment of the horizontal dipole was directed perpendicularly to the radius of the sphere. The sphere was covered with two concentric layers, which extinguish perpendicularly incident waves and this "chimney sweep-effect" applied to radar-screening. Author (ESRO)

N70-30468# Joint Publications Research Service, Washington, D.C.
TECHNOLOGY AND OPERATIONS OF LONG DISTANCE COMMUNICATIONS FACILITIES
I. P. Petrushin 1 Jun. 1970 188 p refs Transl. into ENGLISH of the book "Teknika i Ekspluatatsya Sredstv Dalney Svyazi" Moscow, Svyaz Press, 1969 p 1–177
(JPRS-50619) Avail: CFSTI

Analyses are presented of technical equipment which can be used for: development of long range communications facilities, automation of intercity telephone communications, radio and television broadcasting, and the creation of a unified automated communications system in the Soviet Union. The principles of technical operation of facilities which have been introduced for long range communications, broadcasting, and television are described as well as the principle methods of measurement and adjustment of lines and tone frequency channels. Author

N70-30469# Technische Hochschule in Wien (Australia). Inst. fuer Hochfrequenztechnik.
STUDIES IN OPTICAL COMMUNICATIONS ENGINEERING (LASERS) Semiannual Report [UNTERSUCHUNGEN ZUR OPTISCHEN NACHRICHTENTECHNIK (LASER) HALBJAHRESBERICHT]
J. Riegl, W. Leeb, G. Koepf, and G. Schiffner 31 Sep. 1969 52 p refs
(ON-2) Avail: CFSTI

The sidelight emission spectra of nitrogen and carbon dioxide lines in CO2-N2-He lasers are constructed. The intensity variations of single lines when the laser beam inside the resonator is switched off are measured and the results are compared with a simple theoretical model. The output signal of a laminar photopickup is calculated upon encounter with the laser beam. The relationship of the beam, pickup lamina, and the lamina coordinate determinants are investigated. A laser communication system is described in which atmospheric disturbances can be appreciably eliminated and the construction of a portable He-Ne laser is discussed. Transl. by R.B.

N70-30487# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INFORMATION TRANSMISSION THEORY
R. L. Dobrushin et al 30 Jan. 1970 34 p refs Transl. into ENGLISH from Kibernetika Na Slushbu Kommunizmu (USSR), v. 5, 1967 p 70 86
(AD-702995; FTD-HT-23-321-69) Avail: CFSTI CSCL 9/4

The theory of information transmission deals with the construction of methods for the coding and decoding of messages and signals with the object of transmitting them along communication channels, and the establishment of principles for the comparison of the effectiveness, noiseproof feature and feasibility of these methods. The principles of this theory are discussed: the conditions under which the transmission of information is possible; the information-theory aspects of the theory of information transmission and certain pertinent mathematical works are specified. In statistical coding the principal problems are: discretization messages; measurement of statistical properties of messages and statistical coding, i.e., the reduction of the sequence of digits by utilizing the statistical properties of messages. TAB

N70-30628*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SPACE PROGRAMS SUMMARY NO. 37-62, VOLUME 2 FOR THE PERIOD 1 JANUARY–28 FEBRUARY 1970. THE DEEP SPACE NETWORK
31 Mar. 1970 144 p refs
(Contract NAS7-100)
(NASA-CR-110388; JPL-SPS-37-62-Vol-2) Avail: CFSTI CSCL 17B

The Deep Space Network (DSN) program is reviewed with discussions on: (1) mission support aspects of planetary flight projects; (2) advanced engineering including tracking and navigational accuracy analysis, communications systems research, communications elements research, and supporting research and technology; (3) development and implementation of space flight operations facility, ground communications facility, deep space instrumentation facility, and DSN project and systems; and (4) operations and facilities including DSN operations and facility engineering. E.C.

N70-30569# Hamburg Univ. (West Germany). Inst. fuer Radiometeorologie und Maritime Meteorologie.
HOW THE WEATHER INFLUENCES RADIOWAVE PROPAGATION [WIE BEEINFLUSST DAS WETTER DIE RADIOWELLENAUSBREITUNG]
Gerda Fengler *In* Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 53–59 refs In GERMAN (See N70-30551 15-34)
Avail: CFSTI

All possible atmospheric influences on the propagation of radio waves, especially ultra short waves, are surveyed because of their growing importance in several fields. ESRO

08 COMPUTERS

Includes computer operation and programming; and data processing. For basic research see: 19 Mathematics.

N70-29218# Naval Postgraduate School, Monterey, Calif.
A SIMULATED MICRO-PROGRAMMED COMPUTER UTILIZING THE GRAPHIC DISPLAY OF AN IBM 360
Alan Wencil Frelich (M.S. Thesis) and Michael Charles Roth (M.S. Thesis) Dec. 1969 120 p refs
(AD-701680) Avail: CFSTI CSCL 9/2

A small hypothetical computer was designed and simulated using a 2250 Display Unit operating on an IBM 360/67 computer. The hypothetical computer features a micro-programming capability which allows the user to design his own machine language structure for any particular application. The 2250 console is set up to simulate the operators console of the hypothetical machine, with the CRT being used to display selected portions of memory and registers. For ease of use, a compiler is included in the system to allow the user to write his microprogram in a higher level language. Discussions of the compiler, the interpreter, and the programming and creation of the proper type of graphic display are included. A set of operating instructions for the hypothetical computer enables the user to program and operate the machine without the need to be familiar with the 2250 display unit beforehand. Author (TAB)

N70-29270# Argonne National Lab., Ill. Applied Mathematics Div.
ARGONNE CODE CENTER: COMPILATION OF PROGRAM ABSTRACTS
M. K. Butler, Marianne Legan, L. Ranzini, and William J. Snow Oct. 1969 203 p refs
(Contract W-31-109-eng-38)
(ANL-7411-Suppl-3) Avail: CFSTI

Additional and revised material is presented on the Argonne compilation of computer program abstracts. The majority of the programs treat various aspects of nuclear physics or reactor physics. The program abstracts are classified by subject area, and a KWIC index is included. NSA

N70-29312# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COMPUTER SYSTEMS (SELECTED ARTICLES)
D. A. Pospelov et al Oct. 1968 30 p refs Transl. into ENGLISH from the Russian
(AD-685527; FTD-MT-24-304-68) Avail: CFSTI CSCL 9/2

Contents: Theoretical problems associated with the joint operation of standard computers as a single system; Estimate of performance indices of one computer system; and Model language for controlling computing medium. TAB

N70-29326# Stanford Linear Accelerator Center, Calif.
SLAC SPIRAL READER CONTROL SYSTEM REFERENCE MANUAL
Michael J. C. Hu Jan. 1970 93 p refs
(Contract AT(04-3)-515)
(SLAC-111) Avail: CFSTI

The design and the operational aspects of SYSTEM GENIE computer control system for the spiral reader, which is a semiautomatic film digitizing machine used to measure photographs of elementary particle interactions in a hydrogen bubble chamber, are presented. NSA

N70-29428# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COMPUTER SYSTEMS (SELECTED ARTICLES)
A. K. Olefir et al 4 Sep. 1968 46 p refs Transl. into ENGLISH from Akad. Nauk Sibirsk. Otdel., Inst. Mat. Vychislitel'nyye Sistemy (USSR), no. 25, 1966 22 p
(AD-684683; FTD-MT-24-266-68) Avail: CFSTI CSCL 9/2

Contents: Diagnostics of digital devices, working with malfunctions; and LYaPAS programming system for the M-20 computer. TAB

N70-29447# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TRANSACTIONS OF THE SYMPOSIUM ON COMPUTATION SYSTEMS (SELECTED ARTICLES)
O. V. Ulin et al 6 Nov. 1968 28 p refs Transl. into ENGLISH from the Publ. "Trudy Simposium Po Vychislitelnym Sistemam" Novosibirsk, Nauka, 1967 p 143 - 151
(AD-684016; FTD-HT-23-911-68) Avail: CFSTI CSCL 9/2

In the first paper some features of two-dimensional matrix structures and methods of their materialization in the form of physical matrices are considered. Calculated (for various combinations of variables a and b) values of function c are arranged as a matrix. Inputs are pulse signals applied to rows and columns of the matrix; they correspond to specified numbers out of the natural set 1, 2, 3,....N. The above simple matrix is applied to a measurement case where the number of output quantization levels is commensurable with the number of discrete values of the input; formulas for errors are deduced. The matrices can be materialized by means of ferrite cores or multiwinding pulse transformers with diode isolators. In the second paper a new approach to designing matrix-type decimal arithmetic units is described, and some of the circuits are detailed. A ten-state matrix is a rectangular lattice of conductors with AND-gates in the intersections. Such matrices built as integrated blocks can be used for addition, subtraction, and multiplication of two single-digit numbers. Formulas for the number of matrices required for exact and approximate arithmetic operations are given. TAB

N70-29449# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOVIET PUNCHCARD AND DATA-INPUT AND OUTPUT EQUIPMENT
V. A. Sobolev et al 1 Dec. 1969 7 p Transl. into ENGLISH from Vopr. Avtomat. Inform. Sistem (Moscow), 1969 p 561 - 563
(AD-701036; FTD-HT-23-542-69) Avail: CFSTI CSCL 9/2

The appendix to the Soviet book Aspects of Information System Automation contains two tables citing the main technical specifications of Soviet-produced punchcard and data processing equipment. TAB

N70-29460# California Univ., Livermore. Lawrence Radiation Lab.
PRELIMINARY STUDIES IN COMPUTER PROCESSING OF OPTICAL EMISSION SPECTROMETER DATA
Arthur L. Langhorst and Walter H. Martin 29 Sep. 1969 30 p refs Sponsored by AEC
(UCRL-50759) Avail: CFSTI

An optical emission spectrometer has been modified to give output data on punched cards. A set of preliminary computer programs in FORTRAN IV for the CDC-6600 Computer, developed to calculate the concentrations of trace elements in biological ash samples, are presented. These programs include decisions usually made by a spectroscopist during operations of standard calibration and computation of element concentration in unknown samples. The computer output consists of (1) a listing of raw intensity data, (2) calculations of intensity ratios using an internal standard method with blank subtraction, (3) calculations of coefficients for a least-square three-degree polynomial fit to calibration standards, (4) rejection of erratic data by use of statistical testing, (5) CRT plotting of standard curves, and (6) calculations of trace element concentration in samples. Examples are given of input and output formats, and a complete listing of the programs is included. Author (NSA)

N70-29496# Lincoln Lab., Mass. Inst. of Tech., Lexington.
GRAPHICS Semiannual Technical Summary Report, 1 Jun. - 30 Nov. 1969
James W. Forgie 7 Jan. 1970 31 p refs
(Contract AF 19(628)-5167; ARPA Order 691)
(AD-700316; ESD-TR-69-384) Avail: CFSTI CSCL 9/2

Graphical output and interactive input routines have been written for the Basic Combined Programming Language (BCPL), offering a useful alternative to assembly language for writing graphical subsystems on TX-2. Design work is under way on the system architecture and software for a new terminal support system intended to serve as many as 20 interactive but nondynamic graphic consoles. A storage scope editor has been implemented on TX-2 with the intent of exploring some of the problems to be encountered in the new system which will have storage scopes for display output. Experiments with the color display on TX-2 await the delivery of a new CRT with longer persistence. A box, or rectangle, generator was designed and installed in an attempt to reduce the display flicker for the semiconductor mask design application. The resulting improvement prompted detailed measurement of display system performance. A new character generator based on the stroke writing principle has been built and is being checked out. A program written to demonstrate the application of interactive graphics to regional planning has incidentally shown that the storage scope can provide quite adequate eight-level gray-scale area maps.

Conclusions drawn from two years experience with programs that aid in the design of semiconductor masks have led to the design of a radically different, high performance, new system for integrated circuit layout and mask making. Progress has been made in the development and validation of a high-speed algorithm for testing the planarity of a graph which is expected to have application in the layout problem. Author (TAB)

N70-29541# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ASSOCIATIVE MEMORY FOR AUTOMATIC INFORMATION PROCESSING SYSTEMS

N. I. Gryaznov 26 Sep. 1969 21 p refs Transl. into ENGLISH from the Russian

(AD-700311; FTD-MT-24-203-69) Avail: CFSTI CSCL 9/2

A memory device in which the search for information is made in any specified portion of the memory storage is known as an associative memory device (AMD). The creation of the AMD is one of the methods by which parallel processing of the information stored in the memory device is potentially possible. As a result, the amount of time spent in retrieval is substantially reduced, and the efficiency of the information processing is consequently increased. This article is devoted to a description of the AMD and the methods of retrieval of its information. The basic function of the AMD is the comparison of a specified code of information search with all the codes stored in the memory device. An explanation of two methods of associative search is given, these two methods being differentiated by their use of coincidence and non-coincidence logic operations. TAB

N70-29589# Sandia Corp., Albuquerque, N. Mex.

A GUIDE TO THE SANDIA MATHEMATICAL PROGRAM LIBRARY

C. B. Bailey Jan. 1970 89 p refs

(SC-M-69-337) Avail: CFSTI

The library consists of a number of dependable, high quality, general purpose mathematical computing routines. A general guide to the library and a philosophy of library development are presented. Author

N70-29659# Atomic Energy Commission Research Establishment, Riso (Denmark).

USE OF THE DIGITAL PLOTTER IN CONNECTION WITH GIER AND GIER ALGOL3

Leif Hansson Aug. 1969 17 p refs

(PB-187641; RISO-M-921) Avail: CFSTI CSCL 09B

The procedures are described for the control of the digital plotter connected with the GIER electronic computer. USGRDR

N70-29668# Atomic Energy Commission Research Establishment, Riso (Denmark).

ELECTRONICS DEPARTMENT: PLE. THE PROGRAM LISTING EDITOR FOR PDP-8

J. V. Olsen Aug. 1969 11 p

(PB-187237; RISO-M-945) Avail: CFSTI CSCL 09B

The Program Listing Editor (PLE) is a PDP-8 program for copying a text stored in ASCII-code on a paper tape. The final printout will be in a standard format (A4:210 mm x 297 mm). The pages may be headed with a text (repeated on top of each page), and they may be numbered consecutively (within: 0-1000). PLE can copy the text line by line, or collected into two columns on each page. PLE is specially intended for copying pass-3 output from the assemblers (PAL, MACRO-8), PAL-D, PAL-S), where the listing will be copied in one column and the symbol list will be printed in two columns to achieve a more attractive format of the document. Author (USGRDR)

N70-29677# Atomic Energy Commission Research Establishment, Riso (Denmark).

HYBRID-COMPUTER CONTROL AND MONITOR INTERFACE

K. Soe Hoejberg Sep. 1969 9 p refs

(PB-187640; RISO-M-951) Avail: CFSTI CSCL 09B

The principle of an interface system for an analog computer and a 12-bit digital computer is described. The control hardware concerned is used for digital computer control of the analog computer, including analog and logic element mode selection, computation of unit address selection and time scale control. The monitor hardware described makes it possible to read out the analog computer elements via a digital voltmeter by means of a digital computer program. USGRDR

N70-29742*# National Aeronautics and Space Administration. Electronics Research Center, Cambridge, Mass.

PROGRAM ANALYSIS: A PROBLEM IN MAN-COMPUTER COMMUNICATION

Joseph Green Washington Jun. 1970 133 p refs

(NASA-TR-R-338; C-89) Avail: CFSTI CSCL 09B

This report presents a display oriented scheme to help the higher level language computer programmer to debug and analyze programs. Timed visual interpretive execution and a variety of user instituted functions permit an informative dialogue between the man and the computer. A prototype implementation of the system using FORTRAN as the higher level language is described, and the results are discussed from the point of view of the system developer as well as the point of view of the user. Also treated is the problem of what a time-sharing system should do to make graphical input tablets useful devices in a time-shared environment. Author

N70-29789# Westinghouse Electric Corp., Pittsburgh, Pa. Atomic Power Div.

ETOG-1: A FORTRAN 4 PROGRAM TO PROCESS DATA FROM THE ENDF/B FILE TO THE MUFT, GAM, AND ANISN FORMATS

D. E. Kusner and S. Kellman Dec. 1969 128 p refs

(Contract AT(30-1)-3845)

(WCAP-3845-1; ENDF-114) Avail: CFSTI

ETOG-1, an extension of the ETOM-1 program, processes basic nuclear data in the ENDF/B format and produces the data required for the generation of MUFT, GAM-I, GAM-II, and ANISN libraries. ETOG-1 is written entirely in ASA standard FORTRAN, and is designed to be computer independent. In addition to printed results, the output includes punched cards in the format appropriate for the generation of the desired library. Author (NSA)

N70-29793*# RAND Corp., Santa Monica, Calif.

ECSS: AN EXTENDABLE COMPUTER SYSTEM SIMULATOR

N. R. Nielsen Feb. 1970 52 p refs

(Contract NAS12-2144)

(NASA-CR-86403; RM-6132-NASA) Avail: CFSTI CSCL 09B

A review of current techniques for simulating computer systems and a description of the major design features of a special-purpose language for such simulations are presented. The memorandum discusses the major design decisions leading to the current structure of the language, and presents some examples of its capabilities and use. One major design decision was to make the language as natural as possible. The ECSS approach is summarized by showing how a typical element of a computer simulation is described in ECSS and in other simulation languages. Author

N70-29806# Philco-Ford Corp., Blue Bell, Pa. Microelectronics Div.

RESEARCH AND DEVELOPMENT OF HIGH SPEED PROCESSOR ARRAYS Interim Summary Report, 22 Jul. 1968 - 31 Oct. 1969

Dec. 1969 70 p refs Prepared for Lincoln Lab., MIT
(Contract AF 19(628)-5167)
(AD-702687; ESD-TR-70-9; IR-4) Avail: CFSTI CSCL 9/2

The report describes program progress for the first four interim periods of a research and development program directed toward the development of high density, high performance, complex digital arrays and their application in system feasibility studies of a high speed Central Processor. An important task of the program was to establish subnanosecond-minimum power ECL microcircuit designs which could be used as effective building blocks for the Processor Arrays. The task required the design, fabrication and evaluation of an array test chip containing different microcircuit designs. The task was accomplished: specific small geometry gate and reference bias microcircuits (gate power dissipation was nominally 15 mW, including complementary outputs) were selected and utilized in the design of an 80-gate Processor Master Array Chip. Functioning high speed 256-bit Read only Memory Arrays were successfully fabricated. A flexible technique for programming these ROMs at the chip level was developed and demonstrated. Yield improvement studies were conducted. Author (TAB)

N70-29945# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

COMPUTING SYSTEMS (SELECTED ARTICLES)

E. V. Evreinov et al Aug. 1968 24 p refs Transl. into ENGLISH from the Russian
(AD-684682; FTD-MT-24-264-68) Avail: CFSTI CSCL 9/2

Contents: High-productivity computing systems; and Some methods for constructing iterative-circuit (literally homogeneous) computers. TAB

N70-29986*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

FAST CARRY ACCUMULATOR DESIGN

William C. Mastin 9 Feb. 1970 73 p refs
(NASA-TM-X-53983) Avail: CFSTI CSCL 09B

Methods for increasing the speed of binary addition by decreasing carry propagation time are reviewed. Particular attention is given to those methods that would be applicable to an accumulator using ones complements with end-around carry for subtraction. An iterative accumulator using pulse logic for input and carry signals is described. Realizations of gated carry, carry-completion detection, and carry-skip circuits that would be compatible with this accumulator are presented. NAND gates are used in the design of the required combinational networks. Author

N70-30027# Stanford Research Inst., Menlo Park, Calif.

DATA PROCESSING IN BULK TRANSFER SYSTEMS

Robert A. Short and Marshall C. Pease, III Jan. 1970 56 p refs
(Contract Nonr-4833(00))
(AD-702061; TR-1) Avail: CFSTI CSCL 9/2

Digital bulk transfer systems are characterized by a truly massive, parallel data transfer, and by very limited logic modification of the data during the transfer. An examination is made of the characteristics and potential application areas of such systems, based on extrapolated capabilities of one particular embodiment of such a system that might be attached to a general-purpose computer. It is concluded that bulk transfer systems offer a substantial increase in performance over that achieved by conventional digital system organizations, but only for certain applications that (1) operate on a large, prestorable data base, (2) require only limited input/output to the store, and (3) can employ algorithms utilizing many parallel, identical operations. Such applications that have been examined include Fourier-transform spectrum analysis, the solution by relaxation methods of partial differential equations, image processing, and function interpolation over a large data base. Certain physical limitations are discussed that restrict the algorithmic flexibility of the system in its present conception, and suggestions are made for further research to avoid or circumvent these limitations. Author (TAB)

N70-30030# Michigan Univ., Ann Arbor. Inst. of Science and Technology.

AN ATMOSPHERIC LIDAR DATA-ACQUISITION SYSTEM USING AN ON-LINE DIGITAL COMPUTER: REPORT OF THE MOUNT HALEAKALA OBSERVATORY

Paul D. Mc Cormick and H. David Hultquist Feb. 1970 51 p refs
(Contract DAHC15-68-C-0144)
(AD-701335; Rept-1386-29-T) Avail: CFSTI CSCL 9/2

The report describes the design and operation of a data-acquisition system which uses digital circuits and an on-line PDP-8/I computer for real-time data processing to make upper atmospheric LIDAR measurements. The system is presently being used with the high-power pulsed ruby laser which has recently been installed at the Mount Haleakala Observatory, Maui, Hawaii. The report discusses the basic concepts involved in obtaining LIDAR measurements of atmospheric backscattering. Expected signal returns for both the current (lower atmosphere) and pulse-counting (upper atmosphere) cases are calculated. Noise and background sources are considered in detail, and the statistical nature of the upper atmospheric experiments is emphasized. Detailed circuit diagrams for the data acquisition system and a LIDAR data-acquisition program for the PDP-8/I computer are also included. Preliminary data obtained with the LIDAR system is presented and compared with prediction. Author (TAB)

N70-30039*# Honeywell, Inc., Hopkins, Minn. Magnetics Dept.

A STUDY OF THE RELIABILITY OF PLATED WIRE COMPUTER COMPONENTS Final Technical Report, 1 Jul. 1968 - 30 Sep. 1969

O. S. Lutes, R. B. Fryer, J. O. Holmen, and J. R. Kench 1 Dec. 1969 120 p refs
(Contract NAS12-2003)
(NASA-CR-86397) Avail: CFSTI CSCL 09B

The reliability of plated wire computer components are described under various conditions of environment and operation. Methods of evaluation and directions for improving the aging characteristics were established. Emphasis was on observing the change of memory operating characteristics, chiefly the degradation of electrical output under simulated conditions of write, read, and adjacent bit disturbance. A thorough characterization was made of the physical and magnetic properties of the plated wire element, using a wide variety of experimental techniques. Observation of aging rates of such properties under various conditions of environment, temperature and magnetic field, and study of the change in aging rates resulting from systematic variation of such properties in the unaged wire are discussed. A review is given of the electrodeposition process, methods, and results of the physical and magnetic characterization of the plated wire element. Experimental results and interpretation of the aging studies are presented. The relation between aging failure modes and worst-case pulse programs which simulate operating conditions of the memory element is described. Author

N70-30047# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).

THE EXTENSION OF THE DATA ACQUISITION SYSTEM OF THE 2.5-m SPACE CHAMBER OF THE INSTITUTE FOR

SPACE SIMULATION OF THE DFVLR AT PORZ-WAHN [DIE ERWEITERUNG DER DATENERFASSUNGSANLAGE FUER DIE 2,5-m-RAUMKAMMER DES INSTITUTS FUER RAUMSIMULATION DER DFVLR IN PORZ-WAHN]
Klaus Kramp, Hans Peter Schmidt, and Klaus Stamer Jan. 1970 97 p refs In GERMAN; ENGLISH summary
(DLR-Mitt-70-02) Avail: CFSTI

The data acquisition system of the Institute for Space Simulation of the DFVLR has been enlarged in order to fulfil the requirements of higher reliability, speed of data reduction, and channel capacity. The new system is controlled by a 16-K-computer operating in FORTRAN. A block diagram of the new total data handling system is given. As an example for the use of the system the software programs covering the test of the satellite GRS-A1 (AZUR) and the read programs for magnetic data tapes on the TR 4 computer installed in the Porz-Wahn division of the DFVLR are explained. Author

N70-30067# Iowa State Univ. of Science and Technology, Ames.
KUBER: THE CONTROL PROGRAM FOR THE USAEC AMES LABORATORY ON-LINE MEASURING SYSTEM
A. H. Klein and W. J. Higby Dec. 1969 42 p refs
(Contract W-7405-eng-82)
(IS-2229) Avail: CFSTI

A program called KUBER has been written to provide control for an on-line measuring machine system for bubble chamber events. The program interprets a table of task words for each measuring machine and performs the tasks specified. It supervises the input of data from the measuring machines and calls routines to process the data. Author (NSA)

N70-30104# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SYMPOSIUM ON METHODS AND EQUIPMENT FOR CONVERSION OF GRAPHIC INFORMATION FOR INPUT INTO ELECTRONIC COMPUTERS
A. I. Petrenko 13 Aug. 1969 9 p Transl. into ENGLISH from Mekhaniz. i Avtomatiz. Upr. (USSR), no. 2, 1967 p 60-61
(AD-700798; FTD-HT-23-27-69) Avail: CFSTI CSCL 9/2

The symposium was attended by 376 representatives of 178 scientific institutions from 48 cities; 67 reports were delivered. Few data are reported about the following graphic-information processors being developed in the SSSR: A logging-chart converter; a graphic-and-map converter; a serial reader of multichannel colored graphics; a parallel reader of multichannel graphics; a multichannel curve reader; an oscillogram reader; an automatic graphic-to-digit converter; a multichannel graphic reader; a graphic-to-code converter. TAB

N70-30141# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN ALGORITHM OF SUCCESSIVE RECOGNITION OF IMAGES
V. A. Dolyatovskii et al 19 Dec. 1969 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), v. 11, no. 6, 1968 p 59-64
(AD-702946; FTD-MT-24-399-69) Avail: CFSTI CSCL 9/2

An algorithm is proposed for successive scanning of an image with delineation of criteria and decision making by a decoding matrix at each step. For delineation of criteria, threshold elements are organized into receptive fields of various diameters, and the decoding matrix is built of threshold elements with aftereffect. An example is given of identification of a set of letters and geometric figures by a dynamic perceptron. Author (TAB)

N70-30143# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
USING THE CREEPING-BOUNDARY IN THIN MAGNETIC FILMS FORM CONSTRUCTION OF AN ELECTRONIC COMPUTER MEMORY ELEMENT
S. K. Dementev et al 18 Dec. 1969 10 p refs Transl. into ENGLISH from Sb. Tr., Vychislitelnye Sistemy (USSR), no. 20, 1966 p 121-132
(AD-703016; FTD-MT-24-398-69) Avail: CFSTI CSCL 9/2

When a thin magnetic film is subjected to an alternating magnetic field along the hard-magnetization axis and a constant magnetic field along the easy-magnetization axis, the domain boundaries begin to creep at fields much lower than the critical fields required for domain shifting. The following method of constructing storage devices is suggested: magnetic films are deployed in the form of a rectangular matrix with their easy axes directed along numeral trunks and their hard axes, along digit trunks. A nondestructive sensing the information recorded on an uniaxial-anisotropy film by a transverse field is possible. The threshold field required for magnetic-creep switching is inversely dependent on the switching-pulse duration. Author (TAB)

N70-30174# Atomic Energy Commission Research Establishment, Riso (Denmark).
HYBRID COMPUTER FORTRAN ROUTINES
K. Soe Hojberg Sep. 1969 17 p refs
(PB-188667; RISO-M-957) Avail: CFSTI CSCL 09B

A software system intended for assistance in the execution of hybrid computer programs is described. The system consists of subroutines written in a machine-oriented language, ALICS II. The subroutines can, however, be called by means of a programme written in the user-orineted language FORTRAN. The routines are used for the exchange of problem data and control signals in a combined analogue/digital computer system: EA 1680/PDP8-4K. Author (USGRDR)

N70-30218# Technical Univ. of Denmark, Lyngby. Lab. of Electromagnetic Theory.
PRODUCTION OF COMPUTER ANIMATED MOVIES FOR EDUCATIONAL PURPOSES
H. H. Elberg Nov. 1969 81 p ref
(R-75) Avail: CFSTI

The main purpose of this work was to produce computer animated movies for educational purposes within electromagnetic theory, and at the same time to prepare a production procedure. The sequence of events in the film is described in a script forming the basis of a program which is then computer processed and stored on magnetic tape. A digital-to-analog converter transfers the information from the tape to an oscillograph screen where the pictures are then photographed. The film production procedure is expanded in this report and films and their programs already produced by this method (e.g. on antenna radiation patterns) are presented and discussed. ESRO

N70-30239# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COMPUTER SYSTEMS
A. K. Olefir et al 7 Nov. 1969 19 p refs Transl. into ENGLISH from the Russian
(AD-700387; FTD-HT-23-438-68) Avail: CFSTI CSCL 9/2

Contents: The effectiveness of software monitoring in the Minsk-222 computer system; and A system for data exchange between two computers. TAB

N70-30247# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
IC DIGITAL DATA SYSTEM FOR MOESSBAUER SPECTROSCOPY
Joseph S. Byrd Jan. 1970 22 p refs
(Contract AT(07-2)-1)

(DP-1212) Avail: CFSTI

A fast multichannel scaler with integrated digital control circuits and a 512-word ferrite-core memory was designed to collect and to store data for Moessbauer spectroscopy. System dead time is 2 microseconds. The data spectrum with up to 4.2 billion counts per channel can be displayed on an oscilloscope and punched on computer cards. Variable mode addressing allows forward and backward scanning. Author (NSA)

N70-30252# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CALCULATING SYSTEMS (SELECTED ARTICLES)

G. E. Pusov et al Oct. 1968 26 p refs Transl. into ENGLISH from the Russian

(AD-685526; FTD-MT-24-374-68) Avail: CFSTI CSCL 9/2

Contents: Analog and quasi-analog computing media; and Investigating superconducting memory elements. TAB

N70-30318# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

METHODS OF IMPROVING THE OPERATIONAL RELIABILITY OF CONTROL COMPUTERS

N. I. Tsiklinskii et al 22 Sep. 1969 37 p refs Transl. into ENGLISH from Avtom. Upravlenie i Vychisl. Tekh. (Moscow), no. 7, 1967 p 206-235

(AD-701991; FTD-HT-23-230-69) Avail: CFSTI CSCL 9/2

Functional checking is a method for enhancing the operational reliability of digital computers. For control computers, the reliability is the capability of the computer to solve problems with a specified accuracy and in a specified time; any deviation from this performance is considered a failure. Two groups - program and hardware - of checkout methods have been known; these groups are subdivided into individual methods. Of these, the operational active check, i.e., the automatic check during computer operation which precludes using incorrect solution, is the most important for control computers. Characteristics of computer checks and their influence on reliability are given. TAB

N70-30362# System Development Corp., Santa Monica, Calif.

PRINCIPAL AFL

Seymour Ginsburg and Sheila Greibach 12 Jan. 1970 57 p refs

(Contract F19628-70-C-0023; Grant AF-AFOSR-1203-67A)

(AD-702527; SDC-SR-3; SDC-TM-738/051/01; AFCRL-70-101) Avail: CFSTI CSCL 5/7

A (full) principal AFL is a (full) AFL generated by a single language, i.e., it is the smallest (full) AFL containing the given language. In the present paper, a study is made of such AFL. First, an AFA (abstract family of acceptors) characterization of (full) principal AFL is given. From this result, many well-known families of AFL can be shown to be (full) principal AFL. Next, a representation theorem for each language in a (full) principal AFL is given involving the generator and one application each of concatenation, star, intersection with a regular set, inverse homomorphism, and a special type of homomorphism. Finally, it is shown that if I1 and I2 are (full) principal AFL, then so are (a) the smallest (full) AFL containing ((the intersection of L1 and L2)/L1 in I1, 12 in 12) and (b) the family obtained by substituting epsilon-free languages of 12 into languages of I1. Author (TAB)

N70-30363# Hawaii Univ., Honolulu.

MULTIPLEXING IN THE ALOHA SYSTEM: MENEHUNE-KEIKI DESIGN CONSIDERATIONS

Richard Binder Nov. 1969 54 p refs

(Contract F44620-69-C-0030)

(AD-702807; Rept-B69-3; AFOSR-70-0741TR) Avail: CFSTI CSCL 9/2

In September, 1968, the Information Sciences Program and the Electrical Engineering Department of the University of Hawaii began work on a research program aimed at (a) developing a system of radio-linked consoles to be integrated into the present UH time-sharing system and (b) strengthening research in information processing at the University of Hawaii through projects which will develop and use the on-line and interactive graphics features of the system. Since the primary goal of this program is to add radio links connecting various units of the University of Hawaii throughout the state to the existing UH on-line computer system, the project has been named the Additive Links on-Line Hawaii Area System - The ALOHA System. The report presents the results arrived at so far in the definition of the multiplexor (MENEHUNE) and user terminals (KEIKI) portions of the system. TAB

N70-30373# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MULTICHANNEL ANALOG - DIGITAL CONVERTER

A. I. Kondalev et al 23 Dec. 1969 8 p Transl. into ENGLISH from Mekhaniz. Avtomatiz. Upr. (USSR), no. 3, 1968 p 32-34

(AD-703003; FTD-MT-24-401-69) Avail: CFSTI CSCL 9/2

The Institute of Cybernetics, AN UkrSSR, developed a system for marking up and partitioning magnetic tape into zones, for analog-to-digital conversion (8 sensors), and for digital recording of the converter output on tape. A magnetic-tape storage from the Soviet-made M-20 digital computer is used. The system can operate either automatically or semiautomatically. TAB

N70-30381 Nottingham Univ. (England). Dept. of Geography.

COMPUTER APPLICATIONS IN THE NATURAL AND SOCIAL SCIENCES, NO. 4: CORRELATION AND REGRESSION. PEBBLE SHAPE MEASURES

R. Till, P. M. Mather, and M. J. Mc Cullagh Sep. 1969 35 p refs

(CRP/RT/1/69) Copyright. Avail: Issuing Activity 7s

A program was written using the techniques of linear correlation coefficients and regression lines to show the relationship between sediment deposition and composition. The program also provides a pictorial output of variable pairs. The shapes of pebbles have been used to indicate their transport history and depositional environment. A computer program was written to analyze shape measurements and to produce a histogram of the frequency distribution of each parameter. ESRO

N70-30435# Joint Publications Research Service, Washington, D.C.

CALCULATING THE PARAMETERS OF A MEMORY SUBSYSTEM WITH AN MOS TRANSISTOR OF A SINGLE TYPE

S. C. Basiladze 3 Jun. 1970 16 p refs Transl. into ENGLISH from Izv. Vuzov SSSR, Radioelektron. (USSR), v. 13, no. 1, 1970 p 3-11

(JPRS-50654) Avail: CFSTI

Methods are considered for designing an integrated circuit internal memory subsystem with MOS transistors. The required relationships between the component parameters of a memory cell for stable operation are derived. A relationship is determined between the number of cells combined on the substrate and the speed of the readout. Various methods of organizing and arranging the cells on the common substrate are discussed in order to minimize the number of subsystem terminals. Author

N70-30438 Nottingham Univ. (England). Dept. of Geography.

COMPUTER APPLICATIONS IN THE NATURAL AND SOCIAL SCIENCES, NO. 5: DATA PROCESSING PACKAGE

M. J. McCullagh Oct. 1969 49 p refs

(DPP/MJM/1/69) Copyright. Avail: Issuing Activity 7s

In research the rapid calculation of simple arithmetic measures or statistical parameters on a desk calculator is often of great use. Usually there is no program available which will accept the data or carry out the exact computations. The program described is both comprehensive in techniques provided and flexible in operation within the limitations of a program source card size of less than 1,000 cards. It is assumed that the program would be run from magnetic tape or disc. ESRO

N70-30439 Nottingham Univ. (England). Dept. of Geography.

COMPUTER APPLICATIONS IN THE NATURAL AND SOCIAL SCIENCES, NO. 1: CLUSTER ANALYSIS

P. M. Mather May 1969 36 p refs
(CA/PMM/2/69) Copyright. Avail: Issuing Activity 7s

Classification of objects or their characteristics is a fundamental problem in many disciplines and when a large number of objects have to be analysed a computerized cluster analysis technique is essential. Basic principles and a FORTRAN program are cited. The discussion is restricted to the treatment of variables of characteristics measured on a continuous scale such as degrees Fahrenheit or centimeters. An example concerning nine morphological characteristics of 30 third order drainage basins is discussed. ESRO

N70-30473# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.

ANALYSIS OF REMOTE TERMINAL BACKLOGS UNDER HEAVY DEMAND CONDITIONS

Donald P. Gaver, Jr. Feb. 1970 21 p refs
(Grant NSF GP-8824)
(TR-39) Avail: Issuing Activity

The nature of terminal backlogs and the delays in the initiation of processing are analyzed. The system features that are considered to cause work backlogs include: (1) the finite rate at which information may be read into local buffers; (2) the finite rate at which transmission of local buffer contents to the central computer occurs; (3) the number of remote terminals that are to be serviced by the central computer system; and (4) the rate at which information is brought to the remote terminals. A probability model appropriate when demand rates are large compared to transmission rates is used to approximate the complex queing problem. F.O.S.

N70-30478# Joint Publications Research Service, Washington, D.C.

YEARBOOK OF OFFICE MECHANIZATION AND COMPUTER TECHNOLOGY, 1968

Endre Hujber et al 3 Jun. 1970 146 p refs Transl. into ENGLISH of the book "Ugyvitelgepesitesi es Szamitastechnikai Evkonyv" Budapest, 1968 p 1 – 170
(JPRS-50647) Avail: CFSTI

Data characterizing the development and status of punched card and electronic data processing are considered. Data concerning the computer installations, training of specialists, material-technical supply, documentation of information, and central program register are given. J.M.C.

N70-30485*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A REAL TIME DIGITAL SIMULATION SUPERVISOR

Jeff Ira Cleveland, II (M.S. Thesis—George Washington Univ.) Apr. 1970 80 p refs
(NASA-TM-X-62957) Avail: CFSTI CSCL 05I

The major objective of this work is to simplify the programing and planning tasks associated with flight simulation investigations to the level of conventional Fortran programming without sacrificing the interactive flexibility required to perform digital simulation. A general description of the computer complex with particular emphasis on the digital simulation subsystem is presented. The general requirements and structure of the supervisor are discussed, along with an overview of its implementation. The structure of a simulation applications program is discussed and the man-machine control interface through the supervisor is described. Special problem areas and special techniques developed to solve the problems are presented. The areas discussed are real time program control, real time data recording, time critical supervisor operation, and error recovery and diagnostics. This discussion illustrates the manner in which the simulation applications program is able, through a series of simple subroutine calls, to form a unified code structure that will perform the task of real time digital simulation. Author

N70-30497# Illinois Univ., Urbana. Coordinated Science Lab.

A PLASMA DISPLAY TERMINAL

Jack Stifle Mar. 1970 28 p refs
(Contract DAAB-07-67-C-0199; Grant NSF GJ-81)
(AD-703195; R-460; UILU-eng-70-205) Avail: CFSTI CSCL 9/2

The report describes a graphics terminal designed for use as a remote computer input-output terminal. The terminal features a plasma display panel, self-contained character and line generators and the ability to communicate over voice grade telephone circuits. Author (TAB)

N70-30540# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

AN EXPERIMENT OF CREATION OF AN INFORMATION RETRIEVAL LANGUAGE ON COMPUTER ENGINEERING

V. K. Vakhabov et al 31 Dec. 1969 9 p refs Transl. into ENGLISH from Tr. Vses. Konf. po Informatsionno-Poiskovym Sisteman i Avtomat. Nauchno-Tekhn. Inform., 3rd (USSR), 1967 p 156 161
(AD-703002; FTD-MT-24-409-69) Avail: CFSTI CSCL 5/2

An information retrieval language of the descriptor type was designed for the subject field computer engineering to exploit a magnetic drum digital computer for 3-4,000 inquiries per day with computer translation of the keywords of the retrieval image into descriptor codes in the absence of corrective feedback from the user during the search. The system would process a number of subject subcorpuses, each comprising about 30,000 documents, with a local information retrieval language for each. A hierarchical organization of concepts and the introduction of grammatical resources were intended to reduce false drops. The descriptor image of each document has an average of 8-10 descriptors. The computer dictionary for translating keywords into descriptor codes consists mainly of nouns and adjectives of the natural language or their abbreviations. The dictionary was initiated in a conventional indexing stage covering 1,300 abstracts, which produced 664 words and 367 descriptions. TAB

N70-30664# Institut fuer Schwingungsforschung, Karlsruhe (West Germany).

COMMUNICATION THEORY AND DIRECT DIGITAL CONTROL [NACHRICHTENTHEORIE UND DIREKTE DIGITALE REGELUNG]

M. Syrbe *In* Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 82 – 86 In GERMAN (See N70-30551 15-34)
Avail: CFSTI

The differences between using one instrument control and a system of successive operations including digital computer scanning techniques, are discussed. Three problems relating to interpretation and mode of operation in the latter are discussed. The optimal time-saving time-sharing of individual signal paths, i.e. continuous adjustment of the channel capacity per signal path to the momentary smallest allowable value, is treated in detail. ESRO

N70-30591# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.

PROBABILITY MODELS FOR BUFFER STORAGE ALLOCATION PROBLEMS

Donald P. Gaver, Jr. and Peter A. W. Lewis (IBM Watson Res. Center) May 1969 26 p refs
(Grant NSF GP-8824)
(TR-32) Avail: Issuing Activity

Various models for use in optimizing the size of buffer units required to store messages passing from the remote terminals of a computer system to the central computer are studied. Problems considered are: (1) the problem of blocking a single memory unit for the use of many messages; (2) the occupancy behavior of a buffer allotted to a single message source; and (3) the occupancy behavior of a buffer that is dynamically shared by many independent sources. Models of blocking and chaining, and shared buffers are included. F.O.S.

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N70-29389# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

FILTER SYNTHESIS TECHNIQUE Final Technical Report, 1 Dec. 1967 30 Nov. 1969

Hugh W. Denny and Charles S. Wilson Feb. 1970 65 p refs
(Contract F30602-68-C-0080)
(AD-702135; GIT-A-1058-F; RADC-TR-69-434) Avail: CFSTI CSCL 9/5

Several active filter techniques for the reduction of receiver interference in the 225 to 400 MHz range are described. Positive feedback Q multiplier techniques were extended to include (1) the use of multiple feedback loops to achieve a high order of stable multiplication in each stage and (2) the use of cascaded stages of Q-multiplied resonators to obtain improved skirt selectivity. Negative resistance Q multiplication was achieved over a wide frequency range through the development of a common collector transistor amplifier that exhibits stable negative resistance properties in the UHF region. The negative resistance amplifier was incorporated into a breadboard model of a tunable filter which employs both active and passive stages to produce a high Q response characteristic with high skirt selectivity over the entire band. An AM cancellation filter that achieves suppression of an unwanted signal by cancellation via a synthesized replica of the signal was developed. The breadboard model demonstrated a suppression capability of 30-35 dB for AM signals and about 50 dB for CW signals. To enhance the capabilities and versatility of UHF active interference suppression filters, linearization techniques for broadband solid state amplifiers were investigated. The application of negative feedback and the use of the push-pull mode of parallel operation provided a significant reduction in harmonic generation while retaining good gain-band-width characteristics in amplifiers of one-watt power output capabilities. Author (TAB)

N70-29443# Atomic Energy Commission, Washington, D.C. Office of Civil Defense.

ELECTROMAGNETIC PULSE PROBLEMS IN CIVILIAN POWER AND COMMUNICATIONS

1969 8 p
(Conf-690824(Summ)) Avail: CFSTI

Results of electromagnetic pulses (EMP) generated by nuclear explosions are briefly described. The energy density in the pulse is sufficiently great so that it is possible for damage or malfunction to occur in electrical or electronic equipment. The EMP damage from a single detonation can occur at distances hundreds of miles from the detonation point. Five conference sessions on power system design; EMP characteristics and effects; warning and communication system design; EMP systems analysis; and status of EMP threat to civilian power and communications are briefly summarized. NSA

N70-29451# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

NOISE IN PARAMETRIC AMPLIFIERS AND VARACTOR FREQUENCY MULTIPLIERS [LE BRUIT DANS LES AMPLIFICATEURS PARAMETRIQUES ET LES MULTIPLICATEURS DE FREQUENCE A VARACTORS]

Henri Pepin (Ph.D. Thesis-Paris Univ., 8 Jul. 1968) 1969 33 p refs In FRENCH; ENGLISH summary
(ONERA-NT-144) Avail: CFSTI

Varactors with an interaction between noise and stability in diodes and variable capacitance with charge loading and fast recovery are evaluated. The external and internal instability mechanisms of these amplifiers are analyzed. Author

N70-29493# Westinghouse Electric Corp., Baltimore, Md. Aerospace and Electronics Systems.

MODULAR SOLID STATE MODULATOR DEVELOPMENT Interim Development Report, 13 Oct. 1969 2 Jan. 1970

Edward H. Hooper, Robert A. Hill, and Howard S. Feldmesser, 13 Jan. 1970 28 p
(Contract N00039-70-C-1506)
(AD-700331) Avail: CFSTI CSCL 17/9

The report summarizes the results of the first quarters effort on a twelve month program to develop a new type of modular, solid state radar modulator. The modulator will have an average power capability of 25 KW (3.85 MW peak). The main power train design was completed and attention is now being directed to details of control circuitry and packaging. The modulator design is unique in that it employs solid state Reverse Switching Rectifiers (RSRs) in an eight module system to generate high power pulses at comparatively low voltage. A high turns ratio pulse transformer converts the pulse to the high voltage form required by an RF tube. A special feature of the modulator will be its capability of operation at any of three different pulse widths (15, 30, or 55 microseconds). Author (TAB)

N70-29527# Los Alamos Scientific Lab., N.Mex.

PHOTOTUBE GAIN STABILIZATION USING GALLIUM PHOSPHIDE LIGHT EMITTING DIODES

Robert Leydig and Roger B. Perkins 10 Feb. 1970 5 p refs
(Contract W-7405-eng-36)
(LA-4263) Avail: CFSTI

Certain characteristics of three commercially available gallium phosphide light-emitting diodes have been measured. Preliminary tests of their effectiveness in photomultiplier gain stabilization systems have been made. It is concluded that the use of such diodes is highly effective for gain stabilization, providing that the environment is temperature stabilized. Author (NSA)

N70-29610# Lincoln Lab., Mass. Inst. of Tech., Lexington.

DISPERSION RELATIONS FOR IMPACT DIODES

Henry Berger 16 Dec. 1969 15 p refs
(Contract AF 19(628)-5167)
(AD-701021; TN-1969-60; ESD-TR-69-410) Avail: CFSTI CSCL 9/1

The report clarifies the nature of the dispersion relation for space-charge waves in IMPACT diodes. It is demonstrated that, in the usual linear approximation, the dispersion relation is always cubic, although suitable transformations of the basic equation appear to yield a quadratic. The implications of this point are discussed in regard to prior results and for a simple, but tractable, generalization of these results. In addition, possible implications for the TRAPATT-ARP controversy concerning the explanation of anomalous mode operation of avalanche diodes are discussed. Author (TAB)

N70-29747# ARO, Inc., Arnold Air Force Station, Tenn.
EXPERIMENTAL VERIFICATION OF MAGNET COIL ANALYTICAL MODELS Final Report, Nov. 1968
R. F. Carter Arnold Eng. Develop. Center Mar. 1970 85 p refs
(Contract F40600-69-C-0001)
(AD-702447; AEDC-TR-69-264) Avail: CFSTI CSCL 9/1

In this study of the elastic stresses in thick, strip-wound magnet coils experimental data are compared with theoretical stresses based on three physical models. It is shown that the floating shell model predicts radial dependence of the circumferential stresses produced by the J x B body forces better than the monolithic disc or magnetic pressure models. The fundamental equations relating the magnetic body forces to the stresses in the conductors are derived from first principles. The instrumentation for measuring stresses within magnet windings is described. A survey of several recent magnet stress studies is included. Author (TAB)

N70-29767*# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
SOLID-STATE MILLIMETER-WAVE POWER GENERATION AND AMPLIFICATION Final Report, 1 Mar. 1966 – 28 Feb. 1970
D. H. Steinbrecher 31 Mar. 1970 7 p refs
(Grant NGL-22-009-163)
(NASA-CR-86400) Avail: CFSTI CSCL 09E

Research and development in millimeter-wave power generation and amplification is reported. A brief synopsis of accomplishments includes: (1) a low-noise 60 GHz mixer was constructed with an approximate 3-dB improvement over the best reported noise figure of a mixer in this frequency range. The diodes used in the mixer were gold-gallium arsenide Schottky-barrier diodes of the honeycomb configuration. (2) Avalanche diodes were characterized over a substantial frequency range (4-12 GHz) on a small signal basis. An equivalent circuit was derived and is currently the basis for low-level negative resistance reflection amplifier design using the avalanche diode as the active element. D.L.G.

N70-29798*# Watkins-Johnson Co., Palo Alto, Calif.
DESIGN AND DEVELOPMENT OF LOW NOISE TRAVELING-WAVE TUBE AMPLIFIERS FOR THE 18 TO 75 GHz FREQUENCY RANGE Final Report, 19 MAY 1967 – 16 FEB. 1969
E. Dornseif and L. Dombro 15 Feb. 1969 55 p
(Contract NAS8-20658)
(NASA-CR-102515) Avail: CFSTI CSCL 09E

A 40 to 75 GHz low-noise amplifier was investigated. Two K-band amplifiers (18.0 to 26.5 GHz) in an 18 pound, 4-1/2 inch diameter, 12 inch package were delivered with a maximum noise figure of less than 11 db. Two Ka-band amplifiers (26.5 to 40.0 GHz) in a 25 pound, 5.1 × 7.5 × 12.2 inch package were delivered. One amplifier has a maximum noise figure of 15.4 db, but is under 15 db over all but the last 1 GHz of bandwidth. The second delivered amplifier is under 15 db across all of the Ka-band. Progress on the 40.0 to 75.0 GHz amplifier demonstrated coupler, cold test, and beam transmission data without any RF performance data. The program had to be curtailed due to lack of funds, but a significant portion of the fabrication and design details were completed. Author

N70-29848# Akademiya Nauk URSR, Kiev.
STATIC TRIGGER CIRCUITS WITH STANDARDIZED DYNAMIC ELEMENTS
Yu. D. Bakulin *In its* Data Collection and Transmission, No. 18 1968 p 125–128 In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

A static trigger circuit is described with switch elements composed of standard ferrite-transistor combinations. The ferrite cores are assumed to have a nominal square-loop hysteresis. Two variants of trigger circuits are shown schematically. Trigger circuits of this type operate reliably over a temperature range of −10 to +60 C, at input trigger rates up to 150 kHz. Transl. by B.E.S.

N70-29849# Akademiya Nauk URSR, Kiev.
SIGNAL POLARITY DISCRIMINATOR
A. M. Agizim *In its* Data Collection and Transmission, No. 18 1968 p 129–132 In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

To improve the resolution of polarity discriminators for use in phasemeters, correlometers, etc., a superimposed oscillatory signal on a test waveform, with a frequency substantially higher than that of the latter, is proposed. The sensitivity of polarity reversal is not limited by normal sensing element hysteresis, but by peak oscillatory spread plus discriminator noise, since linear amplification is not required. The effect can be achieved with parametric elements such as varicaps and thyristors. An example shown uses a transistorized Schmitt trigger which is able to determine the point of polarity crossover within a sensitivity of 0.5 millivolt. Transl. by B.E.S.

N70-29865*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VOLTAGE BREAKDOWN IN A LOW TEMPERATURE CESIUM-VAPOR DIODE
Gale R. Sundberg and Richard G. Seasholtz Washington Jun. 1970 17 p refs
(NASA-TN-D-5852; E-5450) Avail: CFSTI CSCL 09A

Breakdown voltages were determined experimentally for a cesium-vapor diode with electrode temperatures that varied from 350 deg to 900 C. The pressure-spacing product pd ranged from 0.01 to 1 torr-cm. The voltage at breakdown approximately followed Paschen's Law for constant cathode temperatures above 500 C and pd values greater than the pd minimum of about .015 torr-cm. The results indicate that the best combination of inverse characteristics coupled with desirable forward drive properties for high-temperature power conversion devices occurs at the higher cesium pressures. Author

N70-29871*# New Mexico Univ., Albuquerque.
MAGNETORESISTANCE DEVICES Progress Report
T. W. Kim, H. Y. Yu, and W. W. Grannemann Mar. 1970 27 p refs
(Grant NGR-32-004-002)
(NASA-CR-86382; PR-94(70)NASA-028) Avail: CFSTI CSCL 09A

The geometry shapes on magnetoresistance were investigated including the modified Corbino disk. A special nonlinear and asymmetric magnetoresistance device, using a diode to drive the Hall terminals, was made. The design and installation of flash evaporation equipment for indium antimonide thin or thick film research are given. The mobility of Indium Antimonide thin film was measured by the flash evaporation method. Author

N70-29925# ITT Electron Tube Div., Fort Wayne, Ind.
PATTERN THRESHOLD IMAGING TUBE Quarterly Report, 1 Jul. – 30 Sep. 1969

James M. Abraham, Roger W. Hunter, and E. H. Eberhardt Fort Monmouth, N.J. ECOM Dec. 1969 19 p
(Contract DAAB07-69-C-0471)
(AD-701920; ECOM-0471-1; QR-1) Avail: CFSTI CSCL 9/1

The purpose of the work is to develop a camera-tube using an electrostatically focused image-tube section, a flood-gun for cancelling-out ambient information, a storage-target capable of going over first cross-over only when the threshold set by the flood-gun is exceeded, and a vidicon-type gun which will be used to generate a beam which scans the reverse side of the storage-target and generates an output signal only if the storage-target has exceeded the first cross-over. The camera-tube being developed uses sections of various types of tubes which are commercial items. A great part of the effort expended on this contract is the combination of these sections into a single workable tube. A preliminary design of this camera-tube was developed. Author (TAB)

N70-29968*# Westinghouse Electric Corp., Baltimore, Md. Defense and Space Center.
APOLLO COMMUNICATION SYSTEMS SUPPORT, TASK 5: LATERAL PNP DESIGN OPTIMIZATION Final Report
Mar. 1970 53 p refs
(Contract NAS9-6636)
(NASA-CR-108388; WEC-GO-HS-51431) Avail: CFSTI CSCL 09A

The design optimization of lateral PNP transistors is presented. To this end an experimental set of lateral transistors were designed and fabricated. Parameters investigated included the various diffusion profiles as well as the geometric dimension of the transistor. Based on these results another set of transistors were designed and incorporated into a general purpose breadboard MSC-6 which included diffused resistors, pinch resistors, vertical NPN transistors and various designs of lateral PNP transistors. Author

N70-29984# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
CONSTRUCTION AND EVALUATION OF MODEL 745H [TRAVELING WAVE TUBE] Interim Report, 6 Oct. – 6 Nov. 1969
J. E. Grant Nov. 1969 68 p
(Contract N00039-70-C-2517)
(AD-701339; W-3290) Avail: CFSTI CSCL 9/1

The purpose of the program is to construct and evaluate in detail a model 745H traveling wave tube. This tube was primarily developed for use in communication systems and covers the military band from 7.9 to 8.4 GHz. It utilizes a coupled cavity slow-wave circuit which possesses a high interaction impedance to assure good efficiency over the band. In addition, it is mechanically and thermally very rugged. Author (TAB)

N70-30095*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
SELECTING DIGITAL FILTERS FOR APPLICATION TO DETAILED WIND PROFILES
R. E. DeMandel and S. J. Krivo Oct. 1969 145 p refs Prepared for Northrop Corp., Huntsville, Ala.
(Contract NAS8-20082)
(NASA-CR-61325; D149236) Avail: CFSTI CSCL 09A

The application of Martin-Graham digital filters to detailed wind profiles is discussed, and procedures are outlined for selecting filter designs for a variety of applications. The numerous tables and illustrations enable the investigator to evaluate the capabilities and limitations of the many filters from which he may choose. Methods for weight computation and application to wind profile measurements are provided. Author

N70-30125*# Poly-Scientific Div., Litton Precision Products, Inc., Blacksburg, Va. Engineering Div.
DESIGN INVESTIGATION AND DEVELOPMENT OF DESIGN IMPROVEMENTS FOR ST124-M STABILIZED PLATFORM SLIP RING CAPSULES Final Report
E. W. Glossbrenner and S. R. Cole 23 Oct. 1969 231 p ref
(Contract NAS8-20578)
(NASA-CR-102619) Avail: CFSTI CSCL 09A

A research program was conducted to eliminate and/or reduce reliability hazards resulting from insulating deposits that form on precious metal contacts. The design, manufacture, and evaluation of hardware of minimum organic content were considered. Totally inorganic capsules were manufactured and the design and methods of substituting inorganic materials in place of plastics and other organics were investigated. Design and process improvements are suggested for future inorganic capsules. Author

N70-30161# Atomic Energy of Canada, Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
AUTOMATIC LEVEL CONTROL OF LIQUID NITROGEN USING A PRESSURE SENSITIVE DIAPHRAGM SWITCH
J. E. Swiddle and M. Tomlinson Apr. 1969 12 p refs
(AECL-3288) Avail: CFSTI; Atomic Energy of Can., Ltd., Chalk River: $0.50

An automatic method for controlling liquid nitrogen level in cold trap applications is described. A probe inserted into the cold trap transmits pressure changes developed by the head of liquid nitrogen to a pressure sensitive diaphragm switch. The minimum liquid level differential that can be achieved with this system is one to two inches. Author

N70-30191*# Mighigan Univ., Ann Arbor. Electron Physics Lab.
MICROWAVE DEVICE INVESTIGATIONS Semiannual Progress Report, 1 Oct. 1969 – 1 Apr. 1970
W. R. Curtice, W. D. Getty, G. I. Haddad, and R. J. Lomax Apr. 1970 59 p refs
(Grant NGL-23-005-183; Proj. 08400)
(NASA-CR-86407; Rept-7) Avail: CFSTI CSCL 09E

Materials, devices, and novel schemes for generation, amplification, and detection of millimeter-wave energy were investigated. Progress is reported in the following: (1) the study of cyclotron harmonic instabilities, (2) millimeter- and submillimeter-wave detectors, (3) millimeter-wave Gunn-effect devices, and (4) avalanche-diode oscillator analysis. Author

N70-30251# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
FEASIBILITY STUDY AND DESIGN OF AN ANTENNA POINTING SYSTEM WITH AN IN-LOOP TIME-SHARED DIGITAL COMPUTER
Donald C. Enemark (Ph.D. Thesis) Jan. 1970 243 p refs
(Contract N00014-68-C-0196-0003)
(AD-702501; Rept-70-7) Avail: CFSTI CSCL 9/5

The report describes the application of time and frequency domain analysis methods to the study and design of a computer controlled pointing system for a 60-foot parabolic dish antenna to be used in satellite tracking. The emphasis is on the time domain methods including state variable matrix techniques and digital simulation. The validity of the analysis methods is shown by their application to well known examples. The effect of delay in the feedback path on stability is studied. A compensation scheme to combat the undesirable effects of feedback delay is discussed and its limitations noted. The feasibility of including a real time digital computer within the feedback loop as a data source and for digital compensation was studied. The effect on system stability and performance of a random processing delay was examined as the computer was to be available only on a time-shared basis with other tasks. The computer interface and antenna control equipment designed for the system is described in moderate detail. The computer program used for the antenna control and digital compensation is discussed, as well as the improvements in performance made possible by its use. Author (TAB)

N70-30287# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.

REDUCTION OF OSCILLATOR INTERACTION FAILURES WITH FREQUENCY MODULATION

Raymond C. Johnson 19 Jan. 1970 15 p refs
(Contract DAAG39-67-C-0077)
(AD-703018; SR-70-1; HDL-0077-16) Avail: CFSTI CSCL 19/1

The probability of failure of two proximity fuzes employing interacting frequency modulated oscillators is determined. It is shown that, in some fuze to fuze encounter situations, frequency modulation will improve the failure probability of an unmodulated oscillator fuze by the square root of twice the number of lock-in widths to which it is modulated. Author (TAB)

N70-30330# California Univ., Livermore. Lawrence Radiation Lab.

EFFECTS OF SPACE CHARGE, ANODE FIELD, AND INITIAL ELECTRON VELOCITIES ON THE SATURATION CURRENT IN A CROSSED-FIELD PHOTOMULTIPLIER TUBE

Robert M. Bevensee 6 Jan. 1970 22 p Sponsored by AEC
(UCRL-50761) Avail: CFSTI

A model of a practical crossed-field photomultiplier tube is analyzed for the dependence of the tube's saturation current density on the focussing dc fields, the spacing between the cathode and the repeller, the transverse electric field of the anode, and the initial electron velocity normal to the cathode. The effect of space charge on potential distribution but not on electron trajectories is included. Three cases are discussed: that of no anode field and no initial electron velocity, that of a constant or linear anode field and no initial electron velocity, and that of no anode field but an initial electron velocity. The results of this analysis are presented as a set of curves of normalized saturation current density versus the height to which the electrons rise in their cycloidal motion and the cathode-to-repeller spacing. The various curves are distinguished by different values of the parameters that measure the anode field or the initial electron velocity. It is concluded that a photomultiplier tube should be operated with as large a magnetic field for a given repeller voltage and geometry as is practical in order to maximize the saturation current density, which the actual current density would approach in a real tube. Furthermore, both the anode field and the initial electron velocity tend to increase the saturation current density. Author (NSA)

N70-30388# Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics.

THE CONSTRUCTION OF A SIMPLE CONDUCTIVITY PROBE

R. P. Mied and F. J. Merceret, Jr. [1970] 27 p refs
Avail: CFSTI

Plans for a simple probe system are presented and some of the problems in the construction of both the probe and the circuitry are discussed. A template of the printed circuit board containing the amplifier is included, as well as illustrations and photographs. The response of the system to fluctuations in the temperature of the fluid near the probe is also discussed. Author

N70-30404# Army Electronics Command, Fort Monmouth, N.J.

HIGH-EFFICIENCY VHF POWER AMPLIFIER

George R. Oliva, Jr. and Dieter Lohrmann Dec. 1969 48 p refs
(AD-700954; ECOM-3209) Avail: CFSTI CSLC 9/5

The report describes a high-efficiency broadband RF Power amplifier with collector efficiencies as high as 80% at 40 W output in the frequency range from 30 to 76 MHz. The amplifier was designed to fit the RT-524 radio set. The design and testing of the amplifier and associated protection circuitry is discussed. The report also explains the advantage found in using such an amplifier rather than conventional type amplifiers. Author (TAB)

N70-30429*# University Coll. of North Wales, Bangor. School of Engineering Science.

THE APPLICATION OF SCANNING ELECTRON MICROSCOPY TO BULK DEVICES. PART 1: GUNN DIODES

A. Gopinath, D. A. Shaw, D. V. Sulway, and P. R. Thornton Nov. 1968 61 p refs
(Grant NGR-52-117-001)
(NASA-CR-110407) Avail: CFSTI CSCL 09A

An investigation was made of the feasibility of using a refined scanning electron beam to diagnose the properties of small Gunn diodes made in epitaxially grown GaAs with active lengths of the order of 10 microns. The experimental methods are described and a preliminary assessment of the results is presented. Findings indicate that the investigation has: (1) established the worth of the contouring method of signal enhancement and of obtaining quantitative, two-dimensional information in a high resolution instrument ; and (2) shown the value of the method to bulk devices with small active areas. D.L.G.

N70-30433*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AN ANALYSIS, DESIGN, AND FABRICATION OF A VARIABLE FREQUENCY NOVEL DISTRIBUTED PARAMETER FILTER

Harry Francis Benz (M.S. Thesis—Virginia Univ.) Jun. 1970 97 p refs
(NASA-TM-X-62959) Avail: CFSTI CSCL 09E

A new distributed parameter novel null device was designed, simulated, and fabricated. It is based on Kaufman's novel null device, but has the added feature of tunability. Tunability is implemented by considering the two elements of Kaufman's filter as distributed variable resistors and implementing them with MOS-FET's. Author

N70-30465# Notre Dame Univ., Ind.

CHARACTERISTICS OF A SUBOPTIMUM PHASE-LOCK DEMODULATOR

John J. Uhran, Jr. 1 Oct. 1968 11 p refs Submitted for publication
(Grant NSF GK-1547)
(EE-6819) Avail: Issuing Activity

A suboptimum solution to the design of phase lock loops yielded improved performance in the important low signal to noise region. Three loop characteristics of major importance are treated: signal demodulation, lock range and threshold. Experimental curves are presented and compared with previously known results. The approach proves to be simple in form involving only the addition of a specific non-linearity(zero-memory) into the loop's forward path. Author

N70-30492# Auburn Univ., Ala. Radar Technology Lab.

INERTIALESS CIRCULAR ARRAY ANTENNAS. VOLUME 2: THEORY OF AN ELECTRONICALLY SCANNED AZIMUTHAL CONCENTRIC RING CIRCULAR ARRAY Final Report

E. R. Graf and M. D. Fahey 5 Nov. 1969 107 p refs
(Contract DAAH01-67-C-1273)
(AD-701164) Avail: CFSTI CSCL 17/9

The theory of an electronically scanned azimuthal concentric ring circular array applicably for target tracking is described and discussed in this volume while the design and experimental results are presented in Volume 1. The analysis has been performed for a circular array of n concentric rings. Each ring contains $4k$ quarter-wavelength monopoles where k is the number of the ring

counting from the center. A modified hybrid ring was designed for feeding the elements of each ring; this power divider operates bilaterally as is demonstrated by experimental results. A method of obtaining a sum and difference pattern has also been investigated.
Author (TAB)

N70-30504*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
REFLECTION COEFFICIENTS OF HORNS RADIATING INTO DIELECTRIC MATERIALS
Capers Rembert Cockrell (M.S. Thesis—George Washington Univ.) Feb. 1970 88 p refs
(NASA-TM-X-62956) Avail: CFSTI CSCL 09E

The admittance of a uniformly fed aperture is assumed to approximate the mouth admittances of the pyramidal and H-plane horns. Calculations of the admittance (or reflection coefficients) were obtained for the rectangular mouth sizes of pyramidal and H-plane horns under free-space conditions and with slabs of plexiglas and quartz covers. Good agreement in terms of reflection coefficients was obtained between the measured and calculated data for the pyramidal horn. The agreement between measured and calculated reflection coefficients for the H-plane horns was not as good as the agreement obtained for the pyramidal horn. The smaller flare angle (9 degrees) horn data, however, is shown to agree better with the calculations than the larger flare angle (18 degrees) horn data, particularly in magnitudes. This agrees with the fact that in theory as the flare angles approach zero with fixed mouth size the H-plane sectoral horn would approach a uniform waveguide of mouth size cross section; and hence, the aperture admittance would be determined by the expressions derived for the uniformly fed aperture assumption.
Author

N70-30547# Danish Research Centre for Applied Electronics, Copenhagen.
ZENER DIODES: A QUALITY COMPARATIVE STUDY OF 27 DIFFERENT TYPES [ZENERDIODER: KVALITETSSAMMENLIGNENDE UNDERSOGELSE AF 27 FORSKELLIGE TYPER]
A. Norballe Dec. 1969 56 p In DANISH; ENGLISH summary Sponsored by Sammenslutningen for Palideligheds- og Miljoteknik
(ECR-10) Avail: CFSTI

The investigation includes zener diodes but not special temperature compensated reference diodes. Totally 27 different manufactures and types have been examined divided on 6 voltages from 3.3 V to 180 V. The main effort has been laid on 400 mW types, even if both 1 W and 10 W types are included. Totally 540 diodes have been tested, partly being load tested at rated effect and partly temperature shock tested and humidity tested. Exposure time has been 6 weeks (about 1000 h). The measurements include zenervoltage, dynamic impedance, leak current, noise, temperature coefficient and estimation of the shape of the characteristic. The examination shows no catastrophic failures and only small degradation failures. There has not been great difference on the different manufactures.
Author

N70-30556# Fraunhofer-Gesellschaft zur Forderung der Angewandten Forschung E. V., Freiburg (West Germany). Inst. fuer Elektrowerkstoffe.
PROBLEMS OF THE GATE INSULATION OF MOS TRANSISTORS [PROBLEME DER GATE-ISOLIERUNG VON MOS-TRANSISTOREN]
C. Fritzsche *In its* Examples of Appl. Res. Jun. 1969 p 33–41 refs In GERMAN (See N70-30551 15-34)
Avail: CFSTI

For efficient operation, it is necessary that the insulation between the gate-electrode and the semiconducting material of MOS-transistors should have the following properties: high breakdown resistance, low electron states at the insulator-semiconductor barrier, and no built-in charges. These conditions can be fulfilled by using carefully prepared amorphous silicon dioxide. The properties of this compound for MOS-devices are discussed.
ESRO

N70-30596# Joint Publications Research Service, Washington, D.C.
ROTARY INDUCTOSYN: GENERAL INFORMATION AND ERROR THEORY
Donat Alekseyevich Bychatin et al 27 May 1970 8 p refs Transl. into ENGLISH from the book "Povorotnyy Induktosin" Leningrad, Energiya Press 1969 p 78–85
(JPRS-50607) Avail: CFSTI

Design and manufacturing technology of the inductosyn is analyzed. Several designs of rotating inductosyns are described and their characteristics are outlined. Fabrication materials and error-reduction alignment procedures are discussed along with technology of manufacturing printed inductosyn windings.
D.L.G.

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see: Specific Physics Categories.

N70-29206 Southern Methodist Univ., Dallas, Tex.
COMPUTER-AIDED MINIMIZATION OF NETWORK SENSITIVITY
Clarence Tandy Cadenhead, Jr. (Ph.D. Thesis) 1968 170 p
Avail: Univ. Microfilms: HC $7.80/Microfilm $3.00 Order No. 69-5518

The modern tools of optimization, circuit theory, and computer science offer promise towards the goal of developing a procedure to design circuits that are optimum with respect to fluctuations in element values. In order to develop the required measure of effectiveness, the concept of network sensitivity is considered and various definitions are compared. A definition is chosen and several important properties are developed. A summary of many important sensitivity relations and derivations are included to provide the reader a ready reference to the principal material on the subject. The concept of sensitivity is extended to develop a measure for a design algorithm that is dependent upon all parameters of the network. Useful optimization procedures are presented and discussed. The design problem is algorithm to minimize network sensitivity is developed. The computer implementation of the algorithm is discussed and several examples are presented to show the advantages and shortcomings of the algorithm. Areas of possible improvement or future study are discussed in the conclusion.
Dissert. Abstr.

N70-29745*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
OPERATING CHARACTERISTICS OF COMPUTER PROGRAMS FOR NONLINEAR TRANSIENT ANALYSIS
W. J. Schneider 1 Jun. 1970 56 p refs
(Contract NAS7-100)
(NASA-CR-110366; JPL-TR-32-1429) Avail: CFSTI CSCL 09C

Considerations relative to the selection and use of four computer programs for the simulation of electronic circuits (CIRCUS, ECAP, MTRAC, and SCEPTRE) are discussed. Various aspects of the analysis are considered, including versatility and simplicity of input, integration methods, and semiconductor modeling. A comparison of the programs and their pertinent operating characteristics is made in terms of the analysis of a single circuit by each of the programs under consideration. Specific results relative to computational speed are presented. Differences between the semiconductor models is presumed to be the dominant reason for differences in the numerical values obtained for the node voltages. The computer times required for this problem are summarized. For each program, the load, execution, and simulation times are listed from the actual computer run. On the basis of programs; CIRCUS is the least effective by a factor of nearly 300. The execution time is extrapolated to estimate the time required to complete 0.000075 of simulation time; on this basis, SCEPTRE would require 3 h, and CIRCUS would require almost three times that long. Author

N70-29778# Notre Dame Univ., Ind. Dept. of Electrical Engineering.

CYCLE SLIPPING AND FM SIGNAL DISTORTION FOR A CLASS OF PHASE LOCK LOOPS

John J. Uhran, Jr. 23 Feb. 1970 24 p refs Presented at ICC, Boulder, Colo., Jun. 1969
(Grant NSF GK-1547)
(EE-705) Avail: Issuing Activity

The effects caused by nonlinearities in phase lock loops in a noisy environment are considered. In order to determine the effect which the limiter has on the modulation signal, the energy at the fundamental frequency, was measured versus signal-to-noise ratio for both a equals 1 and 0. It is shown that as a tracking device, the use of a limiter appears to be a justifiable addition to the system. Tabulated data are given for the exact amount of energy present in harmonics of the different frequencies when noise is present. J.M.C.

N70-30099# Weapons Research Establishment, Adelaide (Australia).

DESIGN OF CHEBYSHEV PASSBAND FILTERS APPROXIMATING A GIVEN ATTENUATION CHARACTERISTIC IN THE STOPBAND

G. R. Haack Jun. 1967 34 p refs
(WRE-TN-PAD-167) Avail: CFSTI

The problem of obtaining an insertion loss function having a prescribed equal ripple in the passband, and satisfying attenuation requirements with a maximum possible margin over the stopband arises frequently in filter design. An iterative approximation procedure, similar to Remez's second method, is described for obtaining the necessary number and location of the attenuation. A Fortran 2 program for the IBM 7090 computer is presented, together with some examples. Author

N70-30355# Danish Research Centre for Applied Electronics, Copenhagen.

INTERFERENCE IN COAXIAL CABLES FROM PARALLEL TRANSMISSION LINES [FORSTYRRELSER PA KOAKSIALKABLER HIDRORENDE FRA PARALLELTLOBENDE TRANSMISSIONSLINIER]

J. Wested Jan. 1970 48 p refs In DANISH; ENGLISH summary
(ECR-11) Avail: CFSTI

A theoretical analysis of VHF interference in coaxial cables from parallel transmission lines or power lines is presented. The treatment was restricted to one coaxial cable and one single line over a common ground plane, but with arbitrary loads on all ports, i.e. on line terminals and ground points for the outer conductor. The cases include different propagation velocities inside and outside the coaxial cable. As regards the cable system as a multiport the general impedance matrix is established to be used in numerical calculations based on measurements of open circuit and short circuit impedances. By using a different method, viz. the theory of coupled transmission lines, explicit formulas for voltages and currents are found. These formulas are used in simplified cases to determine extremum values of the interfering voltage. Couplings through the shielding braid between the disturbing line and the coaxial center conductor are included in the analysis. Author

N70-30356# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.

THREE-WIRE INSULATOR-SHUNTING MODEL FOR HIGH-TEMPERATURE THERMOCOUPLE ERRORS

J. R. Mc Dearman and J. M. Googe 1 Dec. 1969 27 p refs Sponsored by AEC
(TID-25366) Avail: CFSTI

An equivalent circuit and computer solution were formulated for describing the output of a metal-sheathed, bifilar thermocouple degraded by insulator shunting at high temperatures. This steady-state equivalent circuit model can be used for prediction of errors in thermocouple calibrations, for examining the effects of changes in thermocouple configuration or materials properties, and for examining methods for interrogation or surveillance of the shunting thermocouples. Author (NSA)

N70-30495# Texas Univ., Austin. Electronics Research Center.

JOINT SERVICES ELECTRONICS PROGRAM Biannual Report

D. Gary Swanson, ed. 15 Nov. 1969 317 p refs *Its* Biann. of Electron. Res. No. 10
(Grant AF-AFOSR-766-67)
(AD-703285; AFOSR-70-0071TR) Avail: CFSTI CSCL 9/3

Research topics in progress, recent findings, and future plans in the areas of biomedical electronics; information sciences; plasma and quantum electronics; solid state electronics; and acoustics and radio sciences are presented. Author (TAB)

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N70-29317# California Univ., Berkeley. Lawrence Radiation Lab.

OPERATION OF THE POLARIZED-ION SOURCE AND AXIAL INJECTION SYSTEM FOR THE BERKELEY 88-INCH CYCLOTRON

D. J. Clark, A. U. Luccio, F. Resmini, and H. Meiner Oct. 1969 19 p refs Presented at the Intern. Cyclotron Conf., Oxford, 17–19 Sep. 1969
(Contract W-7405-eng-48)
(UCRL-18934; CONF-690921-3) Avail: CFSTI

A polarized-ion source for protons and deuterons is now in operation at the Berkeley 88-inch Cyclotron. The source is of the atomic beam type, using rf transitions and a strong field ionizer. It is mounted vertically above the cyclotron roof shielding. A new axial injection transport system, whose optical elements are electrostatic quadrupole triplets, brings the beam 4.5 meters down to the cyclotron median plane. A duoplasmatron source can inject unpolarized protons through a 90 deg bending magnet. A gridded electrostatic mirror injects the beam into the dummy dee. Electrodes inserted into the dummy dee and dee give narrow accelerating gaps to allow the beam to clear the mirror. They are designed to unplug at vacuum for easy conversion between axial injection and internal source operation. Author (NSA)

N70-29490# Massachusetts Inst. of Tech., Cambridge. Operations Research Center.

AN ANALYTICAL INVESTIGATION OF AIR TRAFFIC IN THE VICINITY OF TERMINAL AREAS

Amedeo R. Odoni Dec. 1969 205 p refs
(Contract Nonr-3963(06); Grant NSF GK-1685)
(AD-700814; TR-46) Avail: CFSTI CSCL 1/2

Several analytical models for air-traffic in the general air terminal area are constructed, to explore some questions about

air-traffic congestion. Attention is first focused on a single runway which is used exclusively for landings. A similar analysis is performed for a runway which is used only for take-offs. The results from the basic models are used in order to develop expressions about queueing and delay characteristics associated with various operations. In particular, an original method for modelling the arrivals queue is developed. The possibility of inserting departures between successive arrivals, thus increasing airport capacity, is also examined in detail. Several parameters of interest associated with this situation are computed. Some numerical results are presented along with a qualitative discussion of various issues.
Author (TAB)

N70-29505# Factory Mutual Research Corp., Norwood, Mass.

EVALUATION OF PROTECTION FROM EXPLOSION OVERPRESSURE IN AEC GLOVEBOXES

C. Yao, J. deRis, S. N. Bajpai, and J. L. Buckley Dec. 1969 127 p refs
(Contract AT(11-1)-1393)
(COO-1393-1; FMRC-16215-1) Avail: CFSTI

A theoretical and experimental research program was undertaken on the problem of explosion venting for application to AEC glovebox safety and protection. A general mathematical model describing the explosion characteristics inside a vented enclosure was derived which can be solved numerically to predict the pressure-time history for a wide variety of venting arrangements such as free-vent, bursting diaphragm relief venting, and filter venting. Good agreement was obtained between theoretical and experimental results for cases of localized explosion in a closed vessel and completely filled explosion in an enclosure with free-vent. For bursting diaphragm explosion relief venting, the calculated and measured pressure-time record showed distinct double pressure peaks, whose characteristics depended on the pressure at which relief occurred. A general procedure for designing a bursting diaphragm type of explosion relief, and methods for confining and exhausting the explosion discharge from the glovebox are presented. NSA

N70-29528*# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Mobility and Environmental Div.

PERFORMANCE EVALUATION OF WHEELS FOR LUNAR VEHICLES

D. R. Freitag, A. J. Green, and K. J. Melzer Mar. 1970 203 p refs
(NASA Order H-5850A)
(NASA-CR-110252; M-70-2) Avail: CFSTI CSCL 22A

One pneumatic and four metal-elastic wheels were laboratory tested in a fine sand to determine their relative performance and to establish a better understanding of the basic principles of the interaction of lightly loaded wheels with soil that is basically frictional, but with a small amount of cohesion. Five levels of sand strength, representing cohesion values ranging from 0 to 0.26 psi were used. The cohesional and frictional properties spanned a range that is believed to include the probable range of lunar soil properties. Programmed-slip tests, in which the slip of the wheel was varied from negative to high positive values, were conducted with a single-wheel dynamometer system. The average speed of the system at zero slip was approximately 0.5 m/sec. Wheel loads were varied from 67 to 670 N to ascertain the effect of load on performance. Data indicate that for loads less than about 220 N, the pull coefficient was constant for a given soil condition. At greater speeds, the rate of increase in the performance coefficient decreased.
Author

N70-29768# Von Karman Inst. for Fluid Dynamics, Rhode Saint-Genese (Belgium).

THE LONGSHOT FREE-PISTON CYCLE. PART 1: THEORY

Kurt R. Enkenhus and Claudio Parazzoli Nov. 1968 73 p refs
(VKI-TN-51) Avail: CFSTI

An approximate analytical solution is presented for the free-piston cycle in the VKI Longshot hypersonic tunnel. The Longshot differs from a conventional gun tunnel in that a heavy piston is used to compress the nitrogen test gas, which is then trapped at the end of the barrel at very high pressure by the closing of a system of check valves as the piston rebounds. Real gas effects are accounted for by assuming that the nitrogen behaves as a Van der Waals gas with variable specific heats.
Author

N70-29938*# Stanford Research Inst., Menlo Park, Calif.

A STUDY OF THE MEANS OF INCREASING THE DYNAMIC RANGE OF VISUAL SIMULATION BY MEANS OF A FLYING-SPOT SCANNER Final Report

Alfred E. Brain Apr. 1970 22 p
(Contract NAS2-5535; SRI Proj 8031)
(NASA-CR-73457) Avail: CFSTI CSCL 14B

An analysis is presented of the factors affecting the performance of flying-spot scanners, especially as they relate to resolution in the image displayed to the pilot. The characteristics associated with lens resolution, film resolution, and scanner resolution are discussed, and the scanner is shown to be the weakest link. Suggestions are made regarding possible ways to improve the overall resolution. The practical performance of the 2H53 equipment was evaluated, and agrees with the above mentioned analysis, in that, the overall resolution of the output image is determined completely by the spot size on the projection cathode-ray tube. Ways of increasing the resolution of the 2H53 equipment are suggested. Conversion of the 2H53 to drive a 525-line color monitor is described. Some calculations are presented regarding the modification of the 2H53 to cover aircraft height in the range 1,000 to 10,000 feet. Measurements were made on the slew rates of the servo systems.
Author

N70-29949# London Univ. (England). Dept. of Aeronautics.

THE SLOTTED WALL TRANSSONIC WIND TUNNEL AT THE CITY UNIVERSITY

D. M. Sykes May 1969 25 p refs
(Aero-69/3) Avail: CFSTI

An intermittent running, ejector-driven, closed-return, wind tunnel was recently acquired. The tunnel may be operated with either a 250 x 200 sq mm slotted wall transsonic working section or contoured nozzle liners giving Mach numbers up to 1.55, and eventually up to 1.8. The facility and its present installation are described, along with tunnel operating and calibration data for both sealed and slotted walls at Mach numbers up to 1.1. Some information on the data acquisition methods and general tunnel equipment is also given.
Author

N70-30049# Aktiebolaget Atomenergi, Studsvik (Sweden).

THE WHOLE BODY MONITOR HUGO 2 AT STUDSVIK: DESIGN AND OPERATION

L. Devell, I. Nilsson, and L. Venner Jan. 1970 28 p refs
(AE-378) Avail: CFSTI

The whole body monitor laboratory is described with special attention to localities, equipment, calibration, and types of measurements. The main monitor, shielded by 53 tons of iron, is equipped with 8 in. diam x 4 in. NaI(Tl) detector and a 512-channel nuclear data analyzer and located at ground level in the Health and Safety Laboratory a few hundred meters from the various laboratories and reactors at Studsvik. Since the start in June 1963 and up to January 1969 more than 4500 measurements have been taken, most of them for radiation dose control purposes. In about 40% of these latter measurements, internal contamination exceeding the normal detection limit of a few nCi was observed. Only a few cases so far have exceeded the maximum permissible quarterly dose set by ICRP.
Author

N70-30130# American National Standards Inst., New York.
RADIOLOGICAL SAFETY IN THE DESIGN AND OPERATION OF PARTICLE ACCELERATORS
Washington NBS Jun. 1970 24 p refs Sponsored by NBS
(NBS-Handbook-107) Avail: SOD $0.30

This standard provides the basic considerations essential to the safe operation of a particle accelerator. It applies principally to particle accelerators with primary energies less than 100 MeV. It considers the characteristics of and controls for radiations as they affect accelerator design, operating procedures, and exposure evaluation. The section on radiation protection design criteria includes radiation shielding considerations and the use of safety systems. Operational health physics requirements are treated extensively, and radiation measurements are discussed in terms of the types of radiation that may be produced and proper techniques for monitoring. The final section, on dose assessment, includes basic exposure considerations such as maximum permissible dose and dose equivalent. Author

N70-30169# Stanford Univ., Calif. High Energy Physics Lab.
ELECTROEXCITATION OF PARTICLE-HOLE STATES IN O16
I. Sick, E. B. Hughes, T. W. Donnelly, J. D. Walecka, and G. E. Walker Jul. 1969 74 p refs
(Contract F44620-68-C-0075; Nonr-225(67))
(AD-702712; HEPL-606) Avail: CFSTI CSCL 20/8

The paper presents experimental data and theoretical results for electroexcitation of T = 1 particle-hole states in O16. TAB

N70-30176# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
WINGS OF THE NATION: SELECTED ARTICLES
G. Svishchev et al 14 Oct. 1969 23 p Transl. into ENGLISH from Kryl'ya Rodiny (Moscow), v. 19, no. 12, 1968 p 9-13
(AD-700376; FTD-HT-23-489-69) Avail: CFSTI CSCL 1/3

The Central Aerohydrodynamics Institute is the largest scientific institution of its kind concerned with the development of equipment, the maintenance of enterprises, and the training of specialists. TsAGI has provided experimental data to Soviet aerospace, marine, and industrial enterprises. During the last years, TsAGIs research laboratories have been equipped with modern hypersonic gas-dynamics installations. Author (TAB)

N70-30452# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).
SURFACE TEMPERATURES ON ELEMENTARY HOLLOW BODIES IN A SIMULATION CHAMBER AND THEIR DEVIATIONS FROM VALUES PREVAILING UNDER NATURAL SPACE CONDITIONS
[OBERFLAECHENTEMPERATUREN AN ELEMENTAREN HOHLKOERPERN IN EINER SIMULATIONSKAMMER UND DEREN ABWEICHUNGEN VON WERTEN BEI NATUERLICHEN WELTRAUMBEDINGUNGEN]
Willi Hallmann Apr. 1970 142 p refs In GERMAN; ENGLISH summary
(DLR-FB-70-12) Avail: CFSTI

The environmental conditions created in space simulation chambers differ from the real conditions that exist in space because of the limits inherent in the physical and technical facilities as well as in the economical possibilities. The temperature distribution within the skin of a nonrotating and rotating hollow cylinder under space and simulation conditions is calculated. A method to determine the temperature deviations in space chambers is demonstrated in order to find the behavior under real conditions from artificially produced conditions. The theoretical deliberations are then proved by experiments. Author

N70-30471# European Space Sounding Rocket Range, Kiruna (Sweden).
[THE EUROPEAN SPACE SOUNDING ROCKET RANGE (ESRANGE)]
J.-O. Lenman 10 Apr. 1970 13 p Presented at the Brit. Interplanet. Soc. Symp. on Sounding Rockets, Cardiff, Engl. Apr. 1970
Avail: CFSTI

The history, safety considerations, and technical equipment of the ESRO rocket range, ESRange, near Kiruna, Sweden, are described in detail and the program since 1966 is summarized. Author (ESRO)

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N70-29236 Minnesota Univ., Minneapolis.
THE INTERACTION OF A HEATED AIR JET WITH A DEFLECTING FLOW
James Woodson Ramsey (Ph.D. Thesis) 1969 176 p
Avail: Univ. Microfilms: HC $8.20/Microfilm $3.00 Order No. 69-20050

An experimental and analytical investigation of the interaction region downstream of a heated subsonic circular air jet issuing into a subsonic mainflow of air has been performed. The experimental studies are performed in a wind tunnel. The secondary (jet) flow is introduced into the test section through a 2.35 cm diameter tube, the exit of which is flush with one wall of the test section. The wall of the test section directly downstream of the injection location is adiabatic and instrumented with thermocouples. In the absence of secondary flow, a fully developed flat plate turbulent boundary layer is present and the freestream turbulence intensity is approximately 0.5 percent. Visualization studies are conducted in the tunnel with the secondary flow directed perpendicular to the main flow. A small tuft is used to examine the flow field in and around the jet. General flow patterns and flow directions are determined. Photographs of the jet as it interacts with the mainstream are obtained by injecting a carbon dioxide - water fog through the injection tube. The photographs show the jet to be irregularly shaped and intermittent indicating the presence of large scale eddies. Dissert. Abstr.

N70-29252 New York Univ., N.Y. School of Engineering and Science.
A NUMERICAL SOLUTION OF THE TURBULENT BOUNDARY LAYER EQUATIONS
Lawrence Weber Carr (Ph.D. Thesis) 1968 57 p
Avail: Univ. Microfilms: HC $3.00/Microfilm $3.00 Order No. 69-4558

An implicit finite difference method is presented for the solution of problems of incompressible and compressible turbulent boundary layer flows using the Prandtl boundary layer equations in the physical plane. The turbulent motion is represented by an eddy viscosity; the method permits an arbitrary choice of the model to be used and is thus proposed as an analytical tool for the comparative study of phenomenological turbulence. Since the major changes in the flow variables occur near the wall boundary in turbulent flow, the numerical procedure incorporates a variable-step-size-differentiation in all y direction calculations so that greater accuracy can be obtained in these regions without excessive computational complexity. The relation between step sizes is arbitrary to allow the introduction of experimental data as input to the analysis. The procedure presented herein is recommended for accurate analysis of turbulent flows influenced by pressure gradients or strong variations in the boundary conditions, e.g., normal or tangential injection. The incompressible flow test cases which were

studied include normal injection and adverse pressure gradient. In addition, two viscosity models have been studied for flat plate flow.
Dissert. Abstr.

N70-29292 Kansas Univ., Lawrence.
AN EXPERIMENTAL STUDY OF THE MICROSHOCK PRESSURE PULSES AND SMALL VAPOR BUBBLES GENERATED BY THE COLLAPSE OF A LARGER VAPOR BUBBLE IN WATER
Norman Wayne Green (Ph.D. Thesis) 1969 302 p
Avail: Univ. Microfilms: HC $13.75/Microfilm $3.90 Order No. 69-21520

This work was conducted as a fundamental search of the mechanisms involved in the collapse of a single vapor bubble in water. High speed motion pictures were obtained of the growth and collapse of vapor bubbles generated by a spark method in water, both in the vicinity of solid boundaries and away from solid boundaries. Pressure responses were obtained in the liquid simultaneously with the filming of the spark bubbles. It was determined that a positive pressure pulse, steep enough to be considered a microshock wave, can be emitted as the result of the collapse of a vapor cavity in water. This positive pulse is immediately followed by a negative pulse of sufficient magnitude to produce tension in the water. Tiny bubbles can appear in the fluid following the collapse of a vapor cavity. These tiny bubbles also collapse. The tiny bubbles are produced as a result of the negative pressure pulse. There are strong experimental indications that the origin of the negative pressure is a result of a rarefaction of an incoming positive pulse from the free surface of the bubble wall.
Dissert. Abstr.

N70-29293 Washington Univ., Seattle.
AN INVESTIGATION OF THE INTERFACIAL DISTURBANCES IN VERTICAL TWO-PHASE FLOW
Daniel Walter Pashniak (Ph.D. Thesis) 1969 113 p
Avail: Univ. Microfilms: HC $5.60/Microfilm $3.00 Order No. 69-20259

An investigation of upward annular gas-liquid flow was made to determine (1) the transition conditions from flow with a uniform liquid film to one with a wavy film surface and (2) the characteristics of the waves that occur on the liquid film. Measurements were made of the average liquid film thickness and the velocity and height of the roll waves which occurred on the liquid film surface for the higher liquid rates. The transition from the smooth-film sub-regime to the wavy film condition was observed to be primarily a function of the liquid rate. An analytical model of smooth-film annular flow was developed to enable predictions of the flow parameters for incipient wave-initiation conditions. The results of the analysis indicated that transition occurred at liquid Reynolds numbers between 48 and 64. The agreement with the experimental observations was such that the analytical model may be used to predict the flow parameters at which roll waves will appear.
Dissert. Abstr.

N70-29367 Connecticutt Univ., Storrs.
EFFECT OF COUPLE STRESSES ON VERY SLOW FLOW PAST A SPHERE
Anthony James Dennis (Ph.D. Thesis) 1968 61 p
Avail: Univ. Microfilms: HC $3.60/Microfilm $3.00 Order No. 69-2115

The couple stress theory considers that, within a continuum, the surfaces of each material element are subjected not only to normal and tangential forces but also moments per unit area called couple stresses, which are assumed to be related to vorticity gradients. The theory includes a new material constant whose ratio to viscosity has the dimensions of length squared. Therefore, a characteristic length is introduced and used as a parameter. The effect of couple stresses is considered for the case of very slow parallel flow past a sphere. Separation of variables reduces the problem to two coupled second order differential equations for two velocity functions of radius. An exact solution for these equations is not possible. Hence, the method of solution is to employ perturbation techniques. The solution obtained shows the effect of couple stresses on the drag of a sphere in very slow flow. The first order correction term, which reduces drag, is proportional to the square of the characteristic length. The effect of couple stress components on the surface of the sphere enters in at higher order terms.
Dissert. Abstr.

N70-29426# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
RELAXING FLOWS IN NOZZLES [ECOULEMENTS RELAXES DANS LES TUYERES]
Roger Prudhomme (Ph.D. Thesis—Paris Univ., 27 Jan. 1969) 1969 181 p refs In FRENCH; ENGLISH summary
(ONERA-P-129) Avail: CFSTI

This paper deals with flows of nonequilibrium reactive gas mixtures. It contains a rational presentation of the equations governing complex chemical mixtures and of composite systems thermodynamics equations. The stationary flows with chemical relaxation are studied with the quasi-unidimensional assumption; a computing method is given. The study of the near-equilibrium zone includes a tentatively precise definition of chemical time and mechanical time; the various near-equilibrium criteria found in the literature are recalled and compared; the problems concerning the integration of differential equations in this domain are analyzed. The stability of the solutions is studied. The problem of sound propagation is analyzed in a medium initially in chemical equilibrium. The equations of transonic quasi-unidimensional flows are established using the method of asymptotic expansions, and are solved. The same method is then applied to transonic bidimensional flows, and particular solutions are given for the partial derivative equations obtained.
Author

N70-29452# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ON THE OSCILLATIONS OF A LIQUID MASS IN A WEIGHTLESSNESS STATE [PROBLEMES D'OSCILLATIONS D'UNE MASSE LIQUIDE EN ETAT D'IMPESANTEUR]
Radyadour Kh. Zeytounian (Ph.D. Thesis—Paris Univ., 10 Mar. 1969) 1969 30 p refs In FRENCH; ENGLISH summary
(ONERA-NT-153) Avail: CFSTI

The linear theory of the small oscillations of a liquid mass under the action of superficial tension is discussed. The fluid was considered inviscid and incompressible, and the mathematical theory is developed and a few examples are given of the solution of the problem.
Author

N70-29471# IIT Research Inst., Chicago, Ill. Dept. of Mechanical and Aerospace Engineering.
FACTORS THAT ENHANCE JET MIXING Final Technical Report
Andrew A. Fejer, William G. Hermann, and Paul T. Torda Oct. 1969 117 p refs
(Contract F33615-67-C-7116)
(AD-700761; ARL-69-0175) Avail: CFSTI CSCL 20/4

The main objective of the experimental study was the enhancement of mixing of jets. Three different techniques of mixing were studied: (a) turbulence production at the jet interface, including the case where the jet or primary stream and secondary stream velocities are equal, (b) addition of a swirl component to the jet, (c) an increase in jet density. All experiments were conducted in a coflowing and ducted secondary air stream atmospheric conditions.
Author (TAB)

N70-29539# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE CALCULATION OF GAS FLOWS IN THE SUBSONIC

PART OF A LAVAL NOZZLE USING APPROXIMATING POLYNOMIALS
Yu M. Danilov 29 Sep. 1969 15 p refs Transl. into ENGLISH from Tr. Aviats. Inst. (Kazan), no. 93, 1967 p 10 16
(AD-700297; FTD-MT-24-213-69) Avail: CFSTI CSCL 20/4

An approximate solution for the flow of an ideal gas in a Laval nozzle is offered. An exact solution of the equation describing such a process is impossible because of nonlinearities. In a subsonic nozzle the basic gas dynamics equation is of the ellipital type and has no real characteristics. In addition, the region of integration is usually open, hence the initial conditions depend on the solution itself, which further complicates the problem. In the majority of cases the problem can be solved, however, by the method of indeterminate coefficients. The only necessary condition is that the contour of the nozzle be analytic and that it can be approximated by a polynomial of the n-th order. The application of this method leads to a system of algebraic equations, some of which can be nonlinear. This system, in general, is not compatible; that is to say, the solution of a number of equations from this system may not satisfy the rest. Hence, an approximate solution is needed which satisfies as closely as possible all equations of the system. Such approximate solutions can be found using the least squares method which produces a closed equation system and therefore makes a solution possible. Use of least squares method is particularly convenient if the equation system is linear.
Author (TAB)

N70-29595# Illinois Univ., Urbana. Water Resources Center.
BOUNDARY EFFECTS ON JET FLOW PATTERNS RELATED TO WATER QUALITY AND POLLUTION PROBLEMS Final Report, 1 Jul. 1967 – 31 Dec. 1969
W. Hall, C. Maxwell, and Hormoz Pazwash Jan. 1970 93 p refs
(Contract DI-14-01-001-1498)
(PB-189787; WRC-RR-28; W70-04068; OWRR-B-017-ILL(1)) Avail: CFSTI CSCL 13B

An experimental and analytical study of the modification of jet flow patterns by a nearby free surface and nearby horizontal or gently downward sloping plane bed is described. The patterns were found to be radically different from those for a deeply submerged jet. Both the free surface and bed tend to attract the jet and both cause spreading of the flow in their proximity. One boundary generally proves to be dominant, depending upon the geometrical parameters. The techniques are first applied to predict the effect of finite nozzle size on deeply submerged jet flows. Then the effect of the free surface on a shallow submerged jet is studied. A strong influence by a small initial upward deflection of the jet is indicated. A preliminary suggestion is made for a mathematical model to represent a shallow submerged jet in a shallow reservoir. The results may be applied in the study or design of discharge outlets, syphon spillways, hydraulic breakwaters and diffusion of tracers in streams. The diffusion of momentum, mass, or heat may be studied using the analytic techniques.
Author (USGRDR)

N70-29656*# New York Univ., N.Y. Dept. of Mathematics.
FORCED SLOSHING OF INVISCID FLUIDS
Stewart S. Antman and Jye Chen Jan. 1970 21 p refs
(Grant NGL-33-016-067)
(NASA-CR-110241; F-70-1) Avail: CFSTI CSCL 20D

A general procedure for analyzing the nonlinear forced sloshing of an inviscid fluid in a cylindrical container is presented. The total energy and the frequency are related through a characteristic parameter in the corresponding linear problem. The application of the technique to circular container is presented.
Author

N70-29712# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TRANSONIC FLOW IN LAVAL NOZZLES [ISSLEDOVANIE TRANSZVUKOVYKH TECHENII V SOPLAKH LAVALYA]
O. S. Ryzhov 2 Dec. 1969 376 p refs Transl. into ENGLISH from the Russian
(AD-701971; FTD-HT-23-1023-68) Avail: CFSTI CSCL 20/4

Contents: General fundamentals; Plane-parallel flows with finite accelerations at the nozzle center; General self-similar plane-parallel flows; Unsteady three-dimensional flows; Flows with a plane sonic surface; Exact theory of the Chaplygin equation.
TAB

N70-29734*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FORTRAN PROGRAM FOR CALCULATING COMPRESSIBLE LAMINAR AND TURBULENT BOUNDARY LAYERS IN ARBITRARY PRESSURE GRADIENTS
William D. McNally Washington May 1970 111 p refs
(NASA-TN-D-5681; E-5256) Avail: CFSTI CSCL 20D

A FORTRAN IV program is presented which solves the two-dimensional, compressible laminar or turbulent boundary-layer equations in an arbitrary pressure gradient. Cohen and Reshotko's method is used for the laminar boundary layer, Sasman and Cresci's method for the turbulent boundary layer, and the Schlichting–Ulrich–Granville method to predict transition. Transition may also be forced at any point by the user. Separation, if it occurs, is predicted for both laminar and turbulent flow. The user may begin with a laminar boundary layer at a stagnation point, or may give initial values for displacement thickness and momentum thickness in either laminar or turbulent flow.
Author

N70-29743*# Alabama Univ., Huntsville. Bureau of Engineering Research.
TWO PHASE FLOW AND HEAT TRANSFER IN POROUS BEDS UNDER VARIABLE BODY FORCES, PART 4 Final Report
Admiral S. Piper and Harold R. Henry Dec. 1969 121 p refs
(Contract NAS8-21143)
(NASA-CR-102708; Rept-22-6560-Pt-4) Avail: CFSTI CSCL 20D

The design of a flight experiment to determine the behavior of two-phase vapor-liquid and/or gas-liquid flow through porous beds in a low gravity environment is described. This thesis is concerned specifically with that part of the experiment in which the second phase (vapor) is obtained by heating the liquid (water) to boiling by using electrical-thermal elements within the porous bed. An idealized mathematical model of the proposed system is developed. The resulting system of differential and algebraic equations is digitally simulated using the International Business Machine (IBM) System/360 Continuous System Modeling Program (CSMP). The objective of the simulation is to study and evaluate the modeling of the system. Representative results using the simulation are presented.
Author

N70-29762# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PRESENT-DAY PROBLEMS OF HYDRODYNAMICS: SELECTION OF ARTICLES
V. S. Tkalich et al 22 Oct. 1969 60 p refs Transl. into ENGLISH from Akad. Nauk Ukr. RSR. Inst. Gidromekhaniki, Materialy Letney po Gidrodinamiki (UKR. SSR), 1967 44 p
(AD-700366; FTD-HT-23-137-69) Avail: CFSTI CSCL 20/9

Contents: Steady-state cyclic-coordinate problems of anisotropically conducting fluids; Flow past bodies; Wave guides; and Principles of the theory of hydrojet motion.
TAB

N70-29770*# Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.
TWO-PHASE FLOW IN TURBINES AND REACTION NOZZLES
V. D. Venediktov Washington NASA Jun. 1970 198 p refs Transl. into ENGLISH of the book 'Turbiny i Reaktivnyye Sopla na Dvukhfaznykh Potokakh' Moscow, Mashinostroyeniye Press, 1969

p 1-187
(Contract NASw-1692)
(NASA-TT-F-613) Avail: CFSTI CSCL 20D

By the method of successive approximations the phase flow, containing small particles, is examined with regard to the velocity and temperature lag of particles behind the gas. The results of computer calculations are presented, permitting a swift evaluation of the fundamental parameters of the exhaust of a two phase flow from a nozzle. It is shown that the presence of a liquid undulating film on the wall of a nozzle leads to substantial losses in the boundary layer and causes a significant lowering of nozzle efficiency. A method for evaluating turbines and the basic types of supplementary losses are examined. In order to achieve a decrease in the losses due to particle impact on the blades, it is expedient to increase the axial clearance between the nozzle apparatus and the turbine wheel, at the same time lowering the erosional attrition of the rotor blades. In a birotative turbine the losses are essentially decreased and its effectiveness and reliability are maintained at a high level. Author

N70-29783# Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.

CONDENSATION OF METAL VAPOR IN A SUPERSONIC CARRIER GAS Final Report

P. M. Sherman, D. D. McBride, T. Chmielewski, T. H. Pierce, and E. Oktay Jun. 1969 257 p refs
(Contract F33615-67-C-1197)
(AD-700325; ARL-69-0089) Avail: CFSTI CSCL 20/4

A study of the condensation of metal vapor in an inert carrier gas was made with primary emphasis on the size of the particles formed and the location of the onset of the condensation. Superheated zinc vapor was generated in a hotshot wind tunnel in a helium carrier gas and expanded in a converging-diverging nozzle. Static pressure measurements were made to determine the location of the onset of condensation. A sampling method was developed and used to determine the size of the condensed particles. An exploding wire arrangement was also used in a few additional studies and condensed platinum and other metal particles were obtained. A few measurements were also made of the condensation of argon. Author (TAB)

N70-29787# New York Univ., N.Y. Courant Inst. of Mathematical Sciences.

INERTIAL RANGE FLOW AND TURBULENT CASCADES

Alexandre Joel Chorin Dec. 1969 39 p refs
(Contract AT(30-1)-1480)
(NYO-1480-135) Avail: CFSTI

Inertial range spectra of turbulent flows are deduced from the equations of motion. An explanation for the validity of universal equilibrium theories is provided. It is shown that Fourier-space cascades and physical-space intermittence are complementary aspects of the same reality. Spectra of the form E(k) = Ak to the minus sigma are found, where k is the wave number, A is independent of k, and sigma is a positive constant. Sigma is evaluated; for the Burgers equation sigma = 2; for the Navier-Stokes equations in both two and three space dimensions sigma = 2.3 + or - 0.15. Author (NSA)

N70-29809*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

NONLINEAR FLUID OSCILLATIONS IN A PARTIALLY FILLED AXISYMMETRIC CONTAINER OF GENERAL SHAPE

John Ray Admire Washington Jun. 1970 74 p refs
(NASA-TN-D-5808; M-361) Avail: CFSTI CSCL 20D

The formulation of the problem resulted in a nonlinear boundary value problem where the nonlinearity occurred in the boundary condition at the free surface of the fluid. The boundary condition at the container wall and the differential equation are linear. The solution is obtained by first linearizing the free surface boundary condition and solving the resulting linear boundary value problem. Then, using the linear solutions, which satisfy the differential equation and the boundary condition at the container wall, a solution is found that satisfies the nonlinear boundary condition at the free surface asymptotically. A solution through the third-order term is developed. Numerical results are obtained for finite-amplitude standing waves near the first antisymmetric linear mode in three axisymmetric vessels. Results are found for three containers, a cylindrical tank with an ellipsoidal bulkhead, a cylindrical tank with a conical bulkhead, and a cylindrical tank with a truncated conical bulkhead. Author

N70-29821*# Techtran Corp., Glen Burnie, Md.

POINT EXPLOSION IN A NON-HOMOGENEOUS ATMOSPHERE [TOCHECHNYY VZRYV V NEODNORODNOY ATMOSFERE]

Kh. S. Kestenboym et al Washington NASA May 1970 8 p refs
Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Moscow), no. 5, 1969 p 25-28
(Contract NASw-2037)
(NASA-TT-F-13012) Avail: CFSTI CSCL 20D

A strong point explosion is examined in an exponential atmosphere without consideration of the real properties of the air. A numerical solution of the point equation of gas dynamics is given and the computation is extended to later phases. Author

N70-29825# Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant.

HYPFIL: A FORTRAN COMPUTER PROGRAM FOR THE INVESTIGATION OF PROCESS PARAMETERS IN SINGLE-STAGE HYPERFILTRATION PROCESSES

W. L. Griffith, R. M. Keller, R. A. Ebel, and R. S. Dillon 10 Feb. 1970 127 p refs
(Contract W-7405-eng-26)
(Y-1699) Avail: CFSTI

A FORTRAN IV computer program was developed for the IBM 360 computer to solve a system of equations to simulate the hydrodynamic flow conditions in tubular systems (rectangular or circular) and to calculate relative water costs. The mathematical model includes the effect of concentration polarization and the dependence of membrane salt rejection on flux and salt concentration. Provisions have been made to simulate the hydrodynamic effect of turbulence promoters and to include allowance for brine disposal costs in the economic model. The inlet velocity and pressure, water recovery, and flow geometry can be optimized to calculate minimum water costs subject to inequality constraints on the independent variables. The optimized solution conforms to an upper limit placed on the product salt concentration and a lower limit on the Reynolds number. Author (NSA)

N70-29854# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.

ASYMPTOTIC ANALYSIS OF DISTURBANCES OF PARALLEL FLOWS FOR SMALL AND LARGE WAVE NUMBERS

Roddam Narasimha and Kirit Yajnik (Indian Inst. of Tech., Kanpur) Jul. 1968 21 p refs
(AE-234-A) Avail: CFSTI

The development of disturbances in quasi-parallel flows of boundary layer type, governed by the Orr-Summerfeld equation, is analyzed by the method of matched asymptotic expansions. The solutions are found to have two length scales one of which is the width of the well-known critical layer and the other is the width of an inviscid layer of the order of the wave-length of the disturbance. The inviscid layer is thus considerably thicker than he boundary layer in the ase of low wave numbers, and considerably thinner for high wave numbers. The production of vorticity outside the inviscid layer is too small to contribute to the zeroth order solution. As a result, the eigenfunctions for the low wave number case depend on the details of the velocity profile, but those for

the high wave number case depend only on the first and second derivatives of the velocity profile at the critical layer. Uniformly valid expansions of the eigenfunctions for both cases are presented.
Author

N70-29948# Virginia Polytechnic Inst., Blacksburg. Dept. of Engineering Mechanics.

THE STABILITY OF PARALLEL FLOWS OF VISCO ELASTIC LIQUIDS BETWEEN PLATES AT REST: AN ASYMPTOTIC SOLUTION

Dean T. Mook and William P. Graebel (Michigan Univ., Ann Arbor) Jan. 1970 29 p refs Prepared in cooperation with Michigan Univ., Ann Arbor
(Contract Nonr-1224(49); Grant NSF GK-3151)
(VPI-E-70-7) Avail: CFSTI

The Orr-Sommerfeld equation, modified to include viscoelastic effects, is solved asymptotically. The method of inner and outer expansions is used to determine the characteristic equation. The results are compared with those obtained numerically and those obtained in an earlier asymptotic solution by other authors. It is shown that the effect of the viscoelasticity is stabilizing. Author

N70-29963*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

CHARTS FOR ESTIMATING BOUNDARY-LAYER TRANSITION ON FLAT PLATES

Edward J. Hopkins, Don W. Jillie, and Virginia L. Sorensen Washington Jun. 1970 30 p refs
(NASA-TN-D-5846; A-3370) Avail: CFSTI CSCL 20D

Charts are presented for rapidly estimating the end of boundary-layer transition for flat plate wind-tunnel models with supersonic leading edges at an angle of attack of 0 deg. These charts were developed from a semiempirical method for deriving an equation that accounts for the combined effects of Mach number, unit Reynolds number, leading-edge sweep, leading-edge bluntness, and wall temperature on transition Reynolds number. Author

N70-29994*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE COMPRESSIBLE FLOW OF TWO COMPONENT, TWO-PHASE MIXTURES IN NOZZLES AND ORIFICES

Robert E. Henry 1970 20 p refs Presented at 1970 Heat Transfer and Fluid Mech. Inst., Monterey, Calif., 10-12 Jun. 1970
(NASA-TM-X-52729; E-5440) Avail: CFSTI CSCL 20D

The critical discharge of two-component, two-phase mixtures through converting nozzles is analytically investigated for initially dispersed or annular-dispersed flow patterns. The processes of interphase heat and momentum transfer are considered, and based on the experimental results of previous investigators, credible assumptions are made for these processes. The resulting model yields predictions for both the critical pressure ratio and flow rate as a function of the stagnation conditions. The analytical results exhibit good agreement with the published air-water nozzle data. The model is extended to compressible flows through orifices and nozzles and again exhibits good agreement with the available two-component data. Author

N70-30013# Ohio State Univ. Research Foundation, Columbus.

VORTEX FLOW IN A CYLINDRICAL CHAMBER Final Report

Lit. S. Han Dec. 1969 34 p
(Contract F33615-67-C-1758)
(AD-702097; ARL-69-0214) Avail: CFSTI CSCL 20/4

Based on the Navier-Stokes equation, the two-dimensional flow field in a cylindrically symmetric, infinitely long swirl chamber was calculated for very low Reynolds numbers. The boundary conditions on the peripheral wall of the chamber were given by zero velocity except for the inlet and exit slit areas for which uniform radial and azimuthal velocity components were assumed. The streamline patterns in a cross-sectional plane of the swirl tube were calculated for different sizes and positions of the inlet and exit slits; however, both openings were always located within the same hemisphere of the chamber. The angles of gas inlet and exhaust were also variable. In general, the results show that the center of vorticity does not coincide with the geometric center of the tube. The streamline patterns appear as deformed ovals which are shifted toward the inlet and exit openings. Author (TAB)

N70-30080# Technion-Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.

A THEORY FOR TURBULENT STAGNATION FLOW

M. Wolfshtein Feb. 1970 35 p refs
(TAE-106) Avail: CFSTI

The influence of turbulence on the velocity and temperature fields in stagnation flow is analyzed. The turbulence is represented by the turbulence energy which is governed by a second order differential equation, and the turbulence length scale which is postulated to be a linear function of the distance from the wall. The results show that the length scale has a very marked influence on the flow. When this length scale is high, the turbulence is augmented, and the skin friction, boundary layer thickness, and heat transfer coefficient increase. Author

N70-30137# Erlangen Univ. (West Germany). Technische Fakultaet.

THE HYDRODYNAMICS OF TWO-PHASE FLOW AROUND FENCE LAYERS: VOLUME PARTS, PRESSURE LOSS AND AXIAL DISPERSION OF THE GAS AND LIQUID PHASES IN UP-CURRENT COLUMNS [ZUR HYDRODYNAMIK ZWEIPHASIG DURCHSTROEMTER SCHUETTSCHICHTEN: VOLUMENANTEILE, DRUCKVERLUST UND AXIALDISPERSION DER GASFOERMIGEN UND FLUESSIGEN PHASE IN AUFSTROMKOLONNEN]

Wolfgang Hellmann (Ph.D. Thesis) 1969 171 p refs In GERMAN Sponsored jointly by Deut. Forsch. Gemeinschaft and Max-Buchner Found.
Avail: CFSTI

The hydrodynamic characteristics of packed columns with a cohesive fluid phase and a distributed gas phase flowing through them from bottom to top were investigated. These up-current columns can be used as chemical reactors as well as exchangers, as the fence can be used either as a catalyzer carrier or for increasing the exchange surface. Author (ESRO)

N70-30155*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

X-RAY OBSERVATIONS OF FLOW PATTERNS IN A MERCURY BOILER

Alex Vary Washington Jun. 1970 38 p refs
(NASA-TN-D-5693; E-4827) Avail: CFSTI CSCL 20D

The X-ray techniques were used to observe two-phase flow patterns in a metallic, forced flow mercury boiler. Helically swaged grooves in the boiler tube were used to swirl the liquid phase. This produced an essentially helical streamlet of liquid flowing in contact with the boiler wall. The observed flow pattern could be generally characterized as stratified and in agreement with the pattern predicted by previous flow pattern mapping studies. The X-ray observations were made under both stable and metastable flow conditions. Author

N70-30334# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ON THE THERMODYNAMICS OF THE PROCESS OF SEPARATION OF A GAS INTO TWO FLOWS WITH DIFFERENT ENERGY

M. G. Dubinskii 12 Nov. 1969 29 p refs Transl. into ENGLISH from Izv. Energ. i Transp. (USSR), no. 4, 1968 p 130-143

(AD-700299; FTD-MT-24-238-69) Avail: CFSTI CSCL 20/4

An ideal process of separation of gas into two flows with different temperatures is examined. At assigned initial pressures and temperature of the gas and defined relationships of flow rates of cold and hot mass, with the help of the second law of thermodynamics, the maximum difference of temperatures is found. Also considered is the inverse process of obtaining mechanical energy in an arrangement in which there are two flows of gas with different temperatures. As a special case with equal mass flow rates of these gases the well-known thermodynamic circuit of a thermal engine is obtained. Author (TAB)

N70-30362# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Luftsaugende Antriebe.

THE RISE OF THRUST AT THE AIR HEATER OF BLOW-DOWN-WIND TUNNELS [UEBER ANLAUF-DRUCKSTOESSE IN LUFTERHITZERN VON TRIEBWERKS-WINDKANAELEN]

Egbert Rie ter and Helmut Hardegen Mar. 1970 25 p In GERMAN; ENGLISH summary

(DLR-FB-70-11) Avail: CFSTI; Zentralstelle fuer Luftfahrtdokumentation und Inform. (ZLDI), Munich: 8 DM

In opening the high pressure valve of a blowdown wind tunnel a pressure shock arises at the air heater putting a high thrust on it. The pressure rise in front of and behind the air heater was investigated and ways of reducing the initial thrust to the order of the steady thrust by controlling the valve are described. Author (ESRO)

N70-30393*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

NUMERICAL SOLUTION OF THE COMPRESSIBLE LAMINAR, TRANSITIONAL, AND TURBULENT BOUNDARY LAYER EQUATIONS WITH COMPARISONS TO EXPERIMENTAL DATA

Julius Elmore Harris (PH.D. Thesis—Virginia Polytechnic Inst.) May 1970 192 p refs

(NASA-TM-X-62963) Avail: CFSTI CSCL 20D

A system of equations describing the laminar, transitional, and turbulent compressible boundary layers for either planar or axisymmetric flows together with a numerical method by which the system can be accurately solved is presented. Stability theory and its relation to transition is discussed, and methods are presented with which reasonable estimates may be made of the location of transition and the extent of the transitional flow region. These methods are used in the numerical procedure to connect the three separate boundary layer regimes into one continuous region described by one system of governing equations. The transitional boundary layer structure is developed from a consideration of the statistical production of turbulent spots. The fully developed turbulent region is treated by replacing the Reynolds stress terms with an eddy viscosity model. A specific turbulent Prandtl number is used to relate the turbulent flux of heat to the eddy viscosity. The numerical method used to solve the system of equations is a three-point implicit finite-difference scheme for variable grid-point spacing in both spatial coordinates. Author

N70-30444# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

CONTRIBUTION TO THE STUDY OF DYNAMIC AND THERMAL PHENOMENA AT REATTACHMENT OF A SUPERSONIC JET ON A CYLINDRICAL SURFACE [CONTRIBUTION A L'ETUDE DES PHENOMENES DYNAMIQUES ET THERMIQUES AU RECOLLEMENT D'UN JET SUPERSONIQUE SUR UNE SURFACE CYLINDRIQUE]

Jean Delery and Pierre Rougier 1969 30 p refs Presented at the Intern. Seminar on Heat and Mass Transfer in Separated Flows, Herceg Novi, Yugoslavia, 1-13 Sep. 1969

(ONERA-TP-758) Avail: CFSTI

Results are presented for an experimental study of the turbulent reattachment of a supersonic axisymmetric jet upon a cylindrical wall in air. The first part concerns the study of the dynamic phenomena in the adiabatic case. In particular, the existence of a correlation of the recompression curves in the zone of reattachment is shown. The second part deals with the thermodynamic phenomena in the event of the reservoir temperature being well in excess of wall temperature. The influence of temperature upon cavity pressure is examined and is followed by a detailed analysis of the distribution of heat flux in the zone of reattachment. Author

N70-30475# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Angewandte Gasdynamik.

QUASI-ONE-DIMENSIONAL NOZZLE FLOWS WITH VIBRATIONAL AND DISSOCIATIONAL NONEQUILIBRIUM [QUASI-EINDIMENSIONALE DUESENSTROEMUNGEN MIT SCHWINGUNGSNICHTGLEICHGEWICHT UND RELAXIERENDE DISSOZIATION]

Klaus Robert Jan. 1970 57 p refs In GERMAN; ENGLISH summary

(DLR-FB-70-01) Avail: CFSTI

A computational method for dealing with steady adiabatic nozzle flows of diatomic gases with vibrational and dissociational nonequilibrium is being developed. Integration starts at the frozen sonic point and is performed independently upstream and downstream. After some general theoretical considerations a program for numerical computation is given. Typical results for nitrogen are discussed. Whereas the axial dependence of velocity, pressure, and density is monotonous, the temperature has a maximum in the convergent nozzle portion. Both, vibrational energy and degree of dissociation freeze, at the latest, immediately downstream of the sonic point. Author

N70-30502*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

THE PENETRATION AND MIXING OF A SONIC HYDROGEN JET INJECTED NORMAL TO A MACH 4 AIRSTREAM

Ruben Clayton Rogers (M.S. Thesis—Virginia Polytechnic Inst.) Mar 1970 83 p refs

(NASA-TM-X-62958) Avail: CFSTI CSCL 20D

An investigation was conducted to determine the effects of jet-to-free-stream dynamic pressure ratio on the penetration and mixing of a sonic hydrogen jet injected normal to a Mach 4 airstream. The hydrogen gas was injected from a circular nozzle flush mounted in a flat plate with a turbulent boundary-layer thickness of 2.70 injector exit diameters at the injector station. The investigation was conducted for values of the dynamic pressure ratio ranging from 0.5 to 1.5. At five downstream stations between 7 and 200 injector diameters the mixing region was surveyed to obtain hydrogen volume concentration and pressure profiles. Results of the investigation indicate that the thick boundary layer had significant effects on the penetration and maximum concentration trajectories when compared to data correlations from other sources. The penetration trajectory was found to be proportional to the dynamic pressure ratio raised to the 0.3 power. Author

N70-30523# Deutsche Versuchsanstalt fur Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Angewandte Gasdynamik.

QUASI-ONE-DIMENSIONAL SONIC POINT CALCULATIONS FOR NONEQUILIBRIUM NOZZLE FLOWS [QUASI-EINDIMENSIONALE BERECHNUNG DER SCHALLSTELLENGROESSEN BEI NICHTGLEICHGEWICHTS-DUESENSTROEMUNGEN]

Klaus Robert Aug. 1969 47 p refs In GERMAN; ENGLISH summary

(DLR-FB-69-51) Avail: CFSTI

In dealing with nonequilibrium flows, the frozen speed of sound is being used for reference. Accordingly, we define here as sonic or reference points those where the flow speed of the gas equals its local frozen sonic value. The theoretical aspects of determining such sonic points as well as the corresponding thermodynamic and gasdynamic variables is being discussed. A numerical method for calculating those variables for steady, quasi-one-dimensional nonequilibrium flows of a diatomic, homonuclear gas is given. Finally we discuss the numerical results relating to a special nozzle configuration and for dissociating nitrogen. Author

N70-30525# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Turbulenzforschung.

THE INSTABILITY OF FREE SHEAR LAYERS: A SURVEY ON THE STATE OF THE ART

Alfons Michalke Mar. 1970 49 p refs

(DLR-MITT-70-04) Avail: CFSTI; Zentralstelle fuer Luftfahrtdokumentation und Inform. (ZLDI), Munich: 15.20 DM

This report surveys current research on the instability of incompressible free shear layers which occur in jets, etc. Experimental results are discussed and theoretical results using linearized theory are considered with respect to the influence of Reynolds number, the spatial growth of disturbances, and the effects of different velocity profile shapes and three-dimensional disturbances. Nonlinear effects are also discussed and the influence of variable basic density distributions and Mach number are considered. Author (ESRO)

N70-30535# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MEASUREMENT OF THE TURBULENCE OF AIR FLOWS AND FLAMES BY THE OPTICAL-DIFFUSION METHOD

A. G. Prudnikov 15 Jan. 1970 14 p refs Transl. into ENGLISH from Goreniev Turbul. Potoke (Moscow), 1959 p 88–140

(AD-702975; FTD-MT-24-440-69) Avail: CFSTI CSCL 20/4

The results of several investigations of the turbulence of airflows and flames using a new method are given. This method is a modification of the diffusion method, combining simplicity and clarity with speed in obtaining data by the hot-wire anemometric method. In evaluating comparative data, measurements, etc., numerous formulae and relationships, such as that of Lagrange, Euler, Taylor and Goldenberg, are used in order to derive mathematical expressions in order to interpret the results. Author (TAB)

N70-30562# Technische Hochschule Stuttgart (West Germany). Inst. fuer Produktionstechnik und Automatisierung.

POSSIBILITIES OF LABORATORY FABRICATION OF FLUID MECHANICAL LOGIC ELEMENTS [MOEGLICHKEITEN DER LABORMAESSIGEN HERSTELLUNG STROEMUNGSMECHANISCHER LOGIKELEMENTE]

A. Ernst *In* Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 68–72 refs In GERMAN Sponsored in part by Wirtschaftsmin. Baden-Wuerttemberg (See N70-30551 15-34)

Avail: CFSTI

The different steps in the fabrication, for laboratory purposes, of fluid logic elements based on wall jet elements are described. ESRO

N70-30574# Fraunhofer Institut, Freiburg (West Germany). Ernst-Mach-Institut.

AEROBALLISTIC INVESTIGATIONS AT HYPERSONIC SPEEDS [AEROBALLISTISCHE UNTERSUCHUNGEN BEI HYPERSCHALLGESCHWINDIGKEITEN]

Alois Stilp and Wolfgang Merzkirch *In* Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 143–147 In GERMAN (See N70-30551 15-34)

Avail: CFSTI

A description is given of an aeroballistic test range in which test missiles are propelled by a light gas gun. ESRO

N70-30598# Ohio State Univ., Columbus. Aeronautical and Astronautical Research Lab.

SIMILAR AND NONSIMILAR SOLUTIONS OF THE FULLY VISCOUS FLOW IN SLENDER CHANNELS Interim Report

Chi-Pong Huang Wright-Patterson AFB, Ohio ARL Jan. 1970 89 p refs

(Contracts F33615-68-C-1220; F33615-69-C-1266)

(AD-703286; ARL-70-0005) Avail: CFSTI CSCL 20/4

Under conditions of low Reynolds numbers, the viscous effects in nozzles are no longer confined to a thin region near the wall, but can extend to the nozzle centerline, forming a fully viscous flow. An integral approach was developed to this problem, based upon fourth-order velocity and total temperature profiles and the use of the constant mass flow through the nozzle. Two-dimensional and axisymmetric, convergent, and divergent channels are examined in the incompressible, and compressible regimes. The incompressible results indicate that straight-walled channels yield similar solutions in the two-dimensional case, but for the axisymmetric nozzle an exponential contour is necessary to obtain similar velocity profiles. Comparisons of these results with other theories is good. Measurements of the nonsimilar velocity profiles of a 5 deg half-angle divergent nozzle operated at mass flow rates below .00001 slugs/sec and centerline velocities near 100 ft/sec are compared with the theoretical profiles. Centerline velocity distribution is well represented along the 10 in channel; the shape of the radial velocity profiles at four stations, although showing correct trends with mass flow rate, is not represented with the same precision. Much of the discrepancy is attributed to the difficulty of measuring static and total pressures of 1 to 10 microns Hg. Author (TAB)

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N70-29250 Washington Univ., Seattle.

ELECTRICAL POLARIZATION IN CARBONATE ROCKS

Wallace Edgar Beckham, Jr. (Ph.D. Thesis) 1968 174 p

Avail: Univ. Microfilms: HC $8.00/Microfilm $3.00 Order No. 69-8984

The main objective of this investigation is to relate the electrical properties of carbonate rocks to mineralogy and texture. To eliminate the effects of interstitial brine solutions, electrical measurements were made on dry carbonate rock samples and samples that had been soaked in distilled water. Dielectric constant, loss factor and resistivity were measured over the frequency range 100 cps to 100 kilo-cps at room temperature on dry carbonate rocks, which contained various kinds, amounts and distributions of clay materials. Samples containing little or no clay minerals were characterized by little or no dispersion of dielectric constant or loss factor. Carbonate rocks containing clays were characterized by dispersion of varying degrees, depending upon the type of clay present and its distribution. Dispersion of dielectric constant for samples containing vermiculite or montmorillonite varied from six to twelve times greater than that of samples containing no clay. Correlation was obtained between dispersion of dielectric constant and loss factor and the known adsorptive properties of vermiculite, montmorillonite and glauconite. It is suggested that dispersion is due to polarization of polar water and organic molecules adsorbed at clay surfaces. Dissert. Abstr.

N70-29313# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OUTERSPACE RESEARCH (SELECTED ARTICLES)
M. Ya Marov et al Jul. 1968 27 p refs Transl. into ENGLISH from the Russian
(AD-681622; FTD-MT-24-152-68) Avail: CFSTI CSCL 4/1

Contents: On the dynamic character of atmospheric density at altitudes of 200-300 km; On the composition of the atmosphere in the region of from 100 to 200 km; On the question of the total amount of neutral hydrogen in the upper atmosphere of the Earth. TAB

N70-29321# Joint Publications Research Service, Washington, D.C.
OCEANOGRAPHY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 225 26 Mar. 1970 p 20–21 refs (See N70-29318 15-34)
Avail: CFSTI

The limnological conference on the cycle of matter and energy in lakes is reported. The problem of pure water, and self-purification of water were discussed with the contamination of water, especially Lake Baykal. F.O.S.

N70-29322# Joint Publications Research Service, Washington, D.C.
TERRESTRIAL GEOPHYSICS
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 225 26 Mar. 1970 p 22–35 refs (See N70-29318 15-34)
Avail: CFSTI

The conference on seismology and seismic-resistant construction is reported. The problems involved in instrumental observations of oscillations of high dams during earthquakes was discussed. Other topics are: (1) spectral analysis method aids in deep seismic studies, (2) prediction of earthquakes, (3) propagation of slow waves in moving plasmas, snd (4) geomagnetic field pulsations prior to polar magnetic disturbances. F.O.S.

N70-29323# Joint Publications Research Service, Washington, D.C.
UPPER ATMOSPHERE AND SPACE RESEARCH
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 225 26 Mar. 1970 p 36–55 refs (See N70-29318 15-34)
Avail: CFSTI

The launching of Molniya-1, Cosmos-323, 324, and 325 satellites were announced. The initial period, apogee, perigee, and inclination for each orbit is listed. Abstracts of articles concerning research in the upper atmosphere are included. F.O.S.

N70-29330# Joint Publications Research Service, Washington, D.C.
OCEANOGRAPHY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 223 27 Feb. 1970 p 22–29 refs (See N70-29327 15-34)
Avail: CFSTI

A book is reviewed concerning Soviet oceanographic expeditions; photographs and brief descriptions of research ships are also included. Abstracts on other oceanographic literature are noted. J.A.M.

N70-29331# Joint Publications Research Service, Washington, D.C.
TERRESTRIAL GEOPHYSICS
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 223 27 Feb. 1970 p 30–43 refs (See N70-29327 15-34)
Avail: CFSTI

An earthquake registering 7 on the Richter scale tremored on January 19, 1970 is investigated. Operating principles and statistical analysis of a gravimeter are reviewed, along with operating accuracy onboard surface vessels or submarines. Seismic signals from earthquakes and explosions, an absolute gravity measuring instrument, and a drilling apparatus for reaching the earth's upper mantle are also discussed. J.A.M.

N70-29332# Joint Publications Research Service, Washington, D.C.
UPPER ATMOSPHERE AND SPACE RESEARCH
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 223 27 Feb. 1970 p 44–49 refs (See N70-29327 15-34)
Avail: CFSTI

Cosmic rays emitted during solar flares and spacecraft designed to resemble comets for flights to near-solar planets are evaluated. Proceedings from a conference on joint processing of spacecraft data among Soviet bloc countries are briefly reviewed. The launchings of Cosmos 320, 321, and 322 are announced. J.A.M.

N70-29339# Joint Publications Research Service, Washington, D.C.
OCEANOGRAPHY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 222 16 Feb. 1970 p 29–52 refs (See N70-29336 15-34)
Avail: CFSTI

Abstracted data covering the following topics are presented: data processing in oceanographic research, summer hydrological conditions in Friza Strait, crystallization of ferromagnetics in underwater oceanic basalts, seasonal dynamics of phytoplankton in Gulf of Aden, and uranium sediments of the Indian Ocean. J.M.C.

N70-29340# Joint Publications Research Service, Washington, D.C.
TERRESTRIAL GEOPHYSICS
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 222 16 Feb. 1970 p 53–68 (See N70-29336 15-34)
Avail: CFSTI

Abstracted data covering the following topics are presented: seismic observations in the Tashkent area, methods for determining period of pendulum oscillations, establishing a fundamental magnetotelluric network, gravimeter readings, seismic wave fields, and kinematic and dynamic characteristics of multiple waves at sea. J.M.C.

N70-29341# Joint Publications Research Service, Washington, D.C.
UPPER ATMOSPHERE AND SPACE RESEARCH
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 222 16 Feb. 1970 p 69–85 refs (See N70-29336 15-34)
Avail: CFSTI

Abstracted data covering the following topics are presented: orbital space stations, weightlessness, particle distribution in upper atmosphere, and magnetic disturbances. J.M.C.

N70-29369# Aeronautical Chart and Information Center, St. Louis, Mo. Linguistic Section.
ON THE PROBLEM OF PROCESSING THE RESULTS OF A GRAVIMETRIC SURVEY [K VOPROSU OB OBRABOTKE REZULTATOV GRAVIMETRICHESKOI S EMKI]
M. A. Aleksidze Dec. 1969 20 p refs Transl. into ENGLISH from Tr. Inst. Geofiz., Akad. Nauk Gruz. SSR (Tiflis), v. 24, no. 1, 1966 p 157–168
(AD-701613; ACIC-TC-1577) Avail: CFSTI CSCL 8/5

In gravimetric surveys under mountainous conditions, the values of gravity and its derivatives are obtained at different heights above an ellipsoid of rotation which represents the earth. Therefore, for an easy interpretation of the obtained values, the derivatives of the earths potential must be reduced to a certain height. The methods used to obtain the gravity values at both the reduction point and points close to it are discussed in this work. Author (TAB)

N70-29373 National Lending Library for Science and Technology, Boston Spa (England).

SOVIET-HUNGARIAN EXPERIMENTAL WORK ON THE DEPTH SEISMIC-REFRACTION SOUNDING IN THE DEBRECEN-BEREGOVA AREA [PRO DOSLIDNI RADYANS'KO-UHORS'KI ROBOTY Z HLYBYNNOHO SEISMOZONDYVANNYA V RAIONI DEBRECEN-BEREHOVE]

V. B. Sollogub et al Feb. 1970 7 p refs Transl. into ENGLISH from Dopov. Akad. Nauk Ukr. RSR, Ser. B (Ukrainia), no. 2, 1967 p 120–123
(NLL-RTS-5549) Avail: Natl. Lending Library, Boston Spa, Engl.: 10s or 1 NLL photocopy coupons

Deep seismic sounding was employed to study the structure of the earth's crust in the Carpathian-Balkan region and in the adjacent parts of the Alpine geosynclinal region. Elastic waves from explosions in the Ukrainian SSR were recorded by Hungarian seismic stations and waves from explosions in Hungary were recorded by Ukrainian seismic stations. The data obtained permit calculations of the approximate depths and angles of inclination of the Mohorovicic discontinuity and analysis of the bedding of the granite layer surface. R.B.

N70-29396# Aeronautical Chart and Information Center, St. Louis, Mo. Linguistic Section.

ON THE PROBLEM OF CALCULATING THE HIGHER DERIVATIVES OF THE GRAVITY POTENTIAL [K VOPROSU VYCHISLENIYA VYSSHYKH PROIZVODNYKH POTENTSYALA SILY TYAZHESTI]

M. A. Aleksidze et al Nov. 1969 25 p refs Transl. into ENGLISH from Tr. Inst. Geofiz., Akad. Nauk Gruz. SSR (Tiflis), v. 24, no. 1, 1966 p 97 110
(AD-701612; ACIC-TC-1576) Avail: CFSTI CSCL 8/5

In connection with the introduction into practice of the processing of geophysical data by electronic computers, it has become possible to use a different approach to the problem of converting the gravity field observed on the earths physical surface into different levels of the upper half-space, as well as of converting the observed field into the higher derivatives of the gravity potential. In the present article the effectiveness of the method for gravity reduction as described above is demonstrated. TAB

N70-29435# Joint Publications Research Service, Washington, D.C.

OCEANOGRAPHY

In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 224 11 Mar. 1970 p 19–26 refs (See N70-29432 15-34)
Avail: CFSTI

Outlines are given for a book on the ocean's resources and a textbook on oceanography. Abstracts are also presented on the following research: simplified equation of state for sea water state; tidal map compilation; density field as indicator of stationary sea currents; emissivity of liquid water; model of turbulent heat exchange over the sea; vertical movements in an inhomogeneous ocean; viscosity effect on internal Tsunami waves; and authigenous phosphoritic modules along shelf of southwestern Africa. E.C.

N70-29436# Joint Publications Research Service, Washington, D.C.

TERRESTRIAL GEOPHYSICS

In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 224 11 Mar. 1970 refs p 27–41 (See N70-29432 15-34)
Avail: CFSTI

Abstracts are given for newspaper items and articles in scientific journals on the following topics: a radio-controlled seismograph with magnetic recording; an electrochemical seismic detector; conference on deep structure of Black Sea depression; seismic detector lowering into an earthquake focus; seismic station operations; magnitude method for identifying underground nuclear explosions; rock density at high pressures; seismic sounding at sea; nature of East Kurile magnetic anomaly; geological interpretation of space photographs of the earth; seismic microzoning of Cheleken City; tectonic features of Ust-Urt and northern Kara-Kum; detecting tectonic dislocations from electric sounding data; anomalous magnetic field in the Sea of Japan; photoelectric recording of geomagnetic field variations; relationship between the electrical resistance of rocks and tectonics; PcP wave in atomic bursts and core-mantle boundary; and energy of elastic impulses in destruction of inhomogeneous materials samples. E.C.

N70-29437# Joint Publications Research Service, Washington, D.C.

UPPER ATMOSPHERE AND SPACE RESEARCH

In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 224 11 Mar. 1970 p 42–55 refs (See N70-29432 15-34)
Avail: CFSTI

Book reviews, news items, and abstracts of scientific articles include information on the following: satellites as navigation aids for shipping; space thrust systems; Orbita satellite television relay operations; experimental measurements on-board Soyuz spacecraft; Soviet-French space research cooperation; aurora observation; nonuniformity in solar wind velocity effects on interplanetary magnetic field structure; space triangulation conditions; Venera 5 and 6 measurements of Venusian atmosphere; visual and instrumental observations of twilight aureole; direct methods in algorithms for spacecraft reentry control; optimim descent maneuver from circumplanetary orbit; automatic assembly and docking in space; and qualitative model for meteor zone circulation. E.C.

N70-29439# Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.

SUMMARY OF OUR PRESENT KNOWLEDGE OF THE PHYSICAL PROCESSES OF MIXING IN THE OCEAN AND COASTAL WATERS, AND A SET OF PRACTICAL GUIDELINES FOR THE APPLICATION OF EXISTING DIFFUSION EQUATIONS IN THE PREPARATION OF NUCLEAR SAFETY EVALUATIONS OF THE USE OF NUCLEAR POWER SOURCES IN THE SEA

Akira Okubo and D. W. Pritchard Sep. 1969 159 p refs
(Contract AT(30-1)-3109)
(NYO-3109-40) Avail: CFSTI

Mathematical formulations for mixing processes in the sea are presented. Solutions for an instantaneous point-source are taken as fundamental. These solutions can be classified into two groups: radially symmetrical solutions and shear-diffusion solutions. A set of guidelines for nuclear safety evaluations is presented. The principle of superposition of the fundamental solution was used to formulate solutions for a variety of practical problems. Predictions with a radially symmetrical solution, i.e., O-P solution, are made for horizontal distributions of radioactivity from instantaneous sources. Boundary conditions and the effect of vertical diffusion are considered to some extent. The O-P solution is also used in the evaluations of concentration distribution from continuous sources: line source, plane source, etc. Predictions with the shear-diffusion solutions are made for the shape variation of patch from an instantaneous small-sized source and for the concentration distribution of plume from a continuous source. Author (NSA)

N70-29492# Lincoln Lab., Mass. Inst. of Tech., Lexington.

SEISMIC DISCRIMINATION Semiannual Technical Summary Report, 1 Jul. 31 Dec. 1969

Richard T. Lacoss 31 Dec. 1969 43 p refs
(Contract AF 19(628)-5167; ARPA Order 512)
AD-700322; ESD-TR-69-412) Avail: CFSTI CSCL 17/10

During the reporting period short-period data from several sites have been used to study the nature of the spectra from presumed explosions, to test a potential new discriminant, and to study depth phases. Surface- and body-wave magnitude data have been obtained and used to study regionalization phenomena. Preliminary studies of ultra-long-period data have been undertaken. Modifications of continental array processing methods have been completed and signal equalization studies initiated. Upgrading of software and hardware facilities has continued. Author (TAB)

N70-29673# California Univ., Livermore. Lawrence Radiation Lab.
THE INFLUENCE OF ENVIRONMENT ON THE INELASTIC BEHAVIOR OF ROCKS
Hugh C. Heard 12 Dec. 1969 15 p refs Presented at ANS Topical Meeting on Eng. with Nucl. Explosives, Las Vegas, Nev., 14-16 Jan. 1970 Submitted for publication Sponsored by AEC
(UCRL-72164; Conf-700101-5) Avail: CFSTI

Quantitative data illustrating the effect of the deformation environment upon the strength and brittle-ductile behavior are presented for a suite of rocks of interest to the Plowshare program; among these are limestone, quartzite, granite, sandstone and oil-shale. More limited results are also presented illustrating the effect of planar anisotropies as well as of grain size upon mechanical properties. The available data then may be used to infer the mechanical response of rocks at the more extreme conditions near a nuclear detonation. Author (NSA)

N70-29700# Coast and Geodetic Survey, Rockville, Md.
MILROW SEISMIC EFFECTS: PRELIMINARY REPORT
Eric R. Engdahl [1969] 21 p Sponsored in part by AEC
(CGS-746-101) Avail: CFSTI

The historical earthquake record has been examined in detail, relative to nuclear testing on Amchitka Island. The record indicates that the Aleutian Arc is an area of high seismic activity. Furthermore, this earthquake activity is highly variable in rate of occurrence and spatial distribution. Recent evidence indicates large earthquakes and tsunamis may originate along a major thrust fault which passes under the Aleutian Ridge. On the basis of all available data, however, no large earthquakes are believed to have occurred along this fault directly under Amchitka Island. To determine the natural earthquake patterns, and the possibly adverse effects of nuclear detonations in the Aleutian Islands, particularly in the Amchitka Island region, the AEC established last spring a network of highly sensitive seismic stations to monitor continuously the seismic activity. This network has significantly improved the capability to detect and locate earthquakes in the region. Following Milrow, data obtained from this network were compared with the historical record and pre-Milrow monitoring. Except in the immediate vicinity of ground zero, there was no evidence for a temporal or spatial change in the pattern of natural earthquake occurrence in the Aleutian Islands. Author (NSA)

N70-29719# Oslo Univ. (Norway). Inst. of Geophysics.
A PHOTOCHEMICAL ATMOSPHERE MODEL CONTAINING OXYGEN, HYDROGEN, AND NITROGEN Final Technical Report, Sep. 1968 - Aug. 1969
Eigil Hesstvedt and Ulf Bertil Jansson Dec. 1969 36 p refs
(Contract DAJA37-69-C-0011)
(AD-701951) Avail: CFSTI CSCL 4/1

An oxygen-hydrogen atmosphere model containing the components O(triplet P), O(singlet D), O2, O3, OH, HO2, H2O2, H2, H2O, and H has been studied. The effect of vertical eddy diffusion has been considered for two sets of eddy diffusion coefficients. Diurnal variations in the number densities of the ten components have been computed from 65 km to 100 km. From these data the diurnal variation of hydroxyl emission has been derived. The model has been extended to include nitrogen components. It has been shown that the NO distribution is determined by vertical eddy transport. Author (TAB)

N70-29720# Royal Coll. of Art, London (England).
THE EFFECTS ON THE LEGIBILITY OF MAPS OF INCREASING INFORMATION Final Technical Report, Oct. 1968 - Sep. 1969
T. C. Hanby and A. Shaw Dec. 1969 52 p refs
(Contract DAJA37-69-C-0382)
(AD-701954) Avail: CFSTI CSCL 8/2

The aims of the project have been to develop objective design standards for mapping that will increase the legibility and the amount of information that can be placed on maps. Such objectives are relevant to the process of making the maximum amount and types of terrain data available to the commander in the field; and further they enhance the legibility of maps. Three separate phases have been undertaken in the project: Pseudo maps - their preparation, testing and significance; overhead projections as a means of cartographic display; and a dictionary of cartographic forms and methods. The present report is confined essentially to the first of these phases. Author (TAB)

N70-29735# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE DEVELOPMENT OF EARTH SCIENCES IN THE USSR: SELECTED ARTICLES, VOLUME 1
A. P. Vinogradov 17 Jan. 1969 405 p refs Transl. into ENGLISH from the book 'Razvitie Nauk o Zemle v SSSR, Sovetskaya Nauk i Tekhnika Za 50 Let' Moscow, Nauka, 1967 807 p
(AD-685004; FTD-MT-24-291-68-Vol-1) Avail: CFSTI CSCL 8/7

Contents: The earth overall; (Figure and gravitational field of the earth, rotation of the earth, terrestrial tides, gravimetry, thermophysics of the earth, internal structure of the earth, geomagnetic field, seismology, geochemistry, biosphere); The earths crust and upper mantle; (Stratigraphy, methods of the determination of absolute age of rocks and geochronology, paleomagnetic researches, lithology, paleogeography, contemporary slow movements of the earths crust, geotectonics, volcanology, mineralogy, petrology, geology of ore deposits, geology of oil, hydrogeology). TAB

N70-29748# Uppsala Univ. (Sweden). Geodetic Inst.
RESEARCH ON METHODS OF DETERMINING LEVEL SURFACES OF THE EARTH'S GRAVITY FIELD Final Scientific Report, 1 May 1964 - 31 Jul. 1968
Erik Tengstrom and Andreas Vogel 8 Oct. 1969 11 p refs
(Contract AF 61(052)-766)
(AD-702486; AFCRL-70-0077) Avail: CFSTI CSCL 8/5

Contents: Studies of dispersion method to determine terrestrial refraction, the use of the results to obtain geoidal sections by means of vertical angle measurements. Geoidal studies by gravimetrical method, using Rudzki reduced gravity over rugged test areas. Use of satellites to improve the gravimetrical method. Horizontal pendulum studies and secular variation of gravity. Author (TAB)

N70-29756# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TRANSACTIONS OF STATE OCEANOGRAPHIC INSTITUTE: COLLECTION OF ARTICLES
A. N. Kryndin et al 4 Oct. 1968 216 p refs Transl. into ENGLISH from Tr. Gos. Okeanogr. Inst. (Moscow), 1964 p 5-140
(AD-683475; FTD-MT-24-241-68) Avail: CFSTI CSCL 8/10

Contents: Seasonal and Interannual variations in ice conditions and position of the edge of the ice in the far eastern seas in relation to peculiarities of atmospheric circulation; Method of precomputation of iciness of the sea of Okhotsk and Gulf of Tatary in the spring period; The possibility of forecasting the expansion of ice along western shores of the central Caspian Sea region; Iciness of the Davis strait; The perodicity of variations in iciness of the Baltic Sea; Aerial photography of ice drift in the sea. TAB

N70-29805# Mount Auburn Research Associates, Inc., Cambridge, Mass.

THEORETICAL STUDY OF THE GENERATION OF INFRASONIC WAVES IN THE ATMOSPHERE Final Report, 27 Nov. 1967 27 Dec. 1969

Walter E. Knabe 27 Dec. 1969 106 p refs
(Contract F19628-68-C-0176)
(AD-702162; AFCRL-70-0051) Avail: CFSTI CSCL 18/3

The generation of acoustic and internal gravity waves in the earths atmosphere by nuclear detonations is considered. Attention is given to a general statement of the problem and to the assessment of the importance of various generation mechanisms in the flows produced by nuclear explosions. From the significant source mechanisms, the corresponding wave emissions are estimated with reference to nuclear detonation outputs. Author (TAB)

N70-29813# California Univ., Berkeley. Space Sciences Lab.

THE CONTRIBUTION TO SURFACE MAGNETIC FIELDS FROM SOURCES INTERNAL AND EXTERNAL TO THE EARTH Final Report

S. H. Ward Mar. 1970 6 p refs *Its* Space Sci. Lab. Ser. No. 11, Issue 20
(Contract Nonr-222(89))
(AD-702494) Avail: CFSTI CSCL 4/1

Bibliographic data are presented for research reported on magnetospheric investigation and several means of submarine detection using natural electromagnetic fields. J.M.C.

N70-29850*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

OBSERVATIONS OF WATERSPOUTS AND THEIR PARENT CLOUDS

Vernon J. Rossow Washington Jun. 1970 65 p refs
(NASA-TN-D-5854; A-3317) Avail: CFSTI CSCL 04B

Results of a study of watersprouts during the summers of 1967 and 1968 in the area around Key West, Florida are presented. Observations were made from Coast Guard Cutters and from aircraft assigned to the Key West Naval Air Station. Measurements made of the electric and magnetic fields associated with these atmospheric vortices indicate that electricity does not play a primary role in their structure and could be eliminated as a generating mechanism or as a means of identification. The measurements did not clarify a secondary or augmentation role for electrical energy because the events which involved electrical activity could not be studied thoroughly enough to identify the relationship with the vortex. Although electricity is eliminated as an essential or defining mechanism, some evidence was found (low cloud tops and a lightning demise of a spout) to indicate that these vortices cannot exist if electricity is too prominent. Of the 104 events sighted, 30 rotated cyclonically, 9 anticyclonically, and the rest either went unnoticed or were not observable. The parent clouds had tops at 8,000 – 12,000 ft and bottoms from 800 – 2,500 ft altitude. Other results obtained on the characteristics of waterspouts supplement those in past publications but still do not appear to disclose the mechanism responsible for the formation of the vortex at the time and location of its occurrence. The relationship of these results to tornado structure is uncertain. Author

N70-29922*# Nagoya Univ. (Japan). Research Inst. of Atmospherics.

TIME DEPENDENT VARIATIONS IN SKY EMISSION TEMPERATURES AT MILLIMETER WAVELENGTHS. ANOMALOUS SKY TEMPERATURE VARIATION WITH ZENITH DISTANCE MEASURED AT A CALM NIGHT AT A WAVELENGTH OF 3.2 mm. MEASUREMENTS OF LINEAR POLARIZATION OF THE MOON AT MILLIMETER WAVELENGTHS

Takashi Yamashita *In* Texas Univ. Elec. Eng. Res. Lab. 3d Quart. Progr. Rept. Dec. 1969 p 1 – 52 refs *Its* Proc., Vol. 17A
(See N70-29920 15-07)
Avail: CFSTI CSCL 04A

Zenith millimeter wave emission measurements of the Crab nebula indicate gradual increased emission temperature through the morning, attaining maximum an hour before ground sunrise, a likelihood of wavelength dependence, and a corresponding rapid decrease. Diurnal and seasonal variations in sky emission temperature are inferred from the analyses. It was confirmed that a radio source moving in the sky gives a varying antenna temperature in accordance with the zenith distance of the extraterrestrial radio source. Observations of attenuation due to oxygen molecule and uncondensed water vapor in the atmosphere, particularly at wavelengths shorter than 20 mm, must be considered in selecting an antenna site for a radio telescope in the microwave range. The scale of surface roughness for the moon is inferred from thermal radiation measurements carried out at wavelengths of 8.6, 4.3, and 3.2 mm, and Bastin's measurement of the polarization at 1.5 mm. Measurements of the linear polarization of the lunar thermal emission coupled with the dielectric constant gives basic information for calculating the average slope of surface roughness. E.M.C.

N70-29931# Pennsylvania State Univ., University Park. Ionosphere Research Lab.

ROCKET MEASUREMENTS OF NITRIC OXIDE IN THE LOWER D-REGION OF THE IONOSPHERE

B. A. Pontano 1 Feb. 1970 96 p refs
(Contract DAHC04-68-C-0034; Grant NSF GP-5611)
(AD-701931; SR-347) Avail: CFSTI CSCL 4/1

A rocket borne probe which measures nitric oxide concentration in the D-region has been designed, built, and successfully flown on September 22, 1968, December 6, 1968, and December 12, 1968. The probe measures changes in ionization caused by photo-ionizing neutral nitric oxide with a flashing Lyman-alpha source. The experiment yielded nitric oxide densities greater than 10 to the 8th power/cc in the 40-63 rm altitude range. Chemical equilibrium conditions do not explain the observed NO data. Below the mesopause, the atomic nitrogen concentration is so low that a photoequilibrium value of NO cannot be reached. Therefore, nitric oxide must be transported from the lower thermosphere, a region where atomic nitrogen is abundant, into the mesosphere and stratosphere. Author (TAB)

N70-29983# Miami Univ., Fla. Rosenstiel School of Marine and Atmospheric Sciences.

ON THE DETECTION OF INERTIAL WAVES WITH PYCNOCLINE FOLLOWERS

Claes Rooth and Walter Dueing Jan. 1970 22 p refs
(Contract Nonr-4008(02))
(AD-700336; ML-70006) Avail: CFSTI CSCL 8/3

The vertical displacements associated with oscillations near the local inertial frequency f, in a stratified ocean, are found to be significant, even very close to f. For a frequency omega = (1 + epsilon)f, the ratio of rms vertical velocity to horizontal velocity is o(the square root of epsilon). Observations near Hawaii, made with a recently developed pycnocline follower, show inertial oscillation events similar to those found by Webster in current meter records, and discussed theoretically by Crepon, and by Pollard. Author (TAB)

N70-29987*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

AURORAL ELECTRON DRIFT AND PRECIPITATION: CAUSE OF THE MANTLE AURORA

R. A. Hoffman Jun. 1970 42 p refs Submitted for publication
(NASA-TM-X-63941; X-646-70-205) Avail: CFSTI CSCL 04A

Data from the Auroral Particles Experiment on OGO-D were analyzed to determine the properties of the band region of low energy electron precipitation in the late morning hours. The existence of this precipitation is consistent with a scheme involving a release of a body of electrons on closed magnetic field lines in the vicinity of midnight at the time of a magnetospheric substorm, with a subsequent drift in local time through the morning hours at least as far as noon. While drifting the electrons encounter a strong pitch angle diffusion mechanism which precipitates them into the atmosphere to produce the mantle aurora. This mechanism seems to exist independent of substorm magnetic activity. The diffusion coefficient must be larger than 0.001/second, and the resulting lifetime of the electrons is about 6,000 seconds. The energy density of the source electrons in the midnight region would not be unreasonably large if the source is in the cusp. Author

N70-30009# Minnesota Univ., Minneapolis. School of Mineral and Metallurgical Engineering.

THE THEORY OF DETERMINATION OF STRESS CHANGES IN A TRANSVERSLY ISOTROPIC MEDIUM, USING AN INSTRUMENTED CYLINDRICAL INCLUSION

Denis S. Berry (Nottingham Univ.) and Charles Fairhurst Jan. 1970 55 p refs
(Contract DA-25-066-eng-14765)
(AD-701108; MRD-TR-1-70) Avail: CFSTI CSCL 8/7

If an elastic matrix (isotropic or anisotropic) contains a single ellipsoidal inclusion, imposition of stress at infinity produces a uniform elastic field within the inclusion. This result is used for the calculation of relations between the stress imposed at infinity on a transversely isotropic matrix and the stress within an infinite cylindrical isotropic inclusion. Allowance is made for axial strain to occur. General orientation of the axis of the inclusion with respect to the axis of elastic symmetry is treated first and the solution is put into a form from which numerical results may be easily obtained. When the axis of the inclusion is parallel or normal to the elastic axis, separate treatments are necessary, leading to direct relations between the two sets of stress components. The latter results are easily particularized to the case of isotropy, showing the correction for non-zero axial strain which should be added to the equations commonly used, as well as giving extra relations for components acting across planes normal to the inclusions axis. Author (TAB)

N70-30089*# Illinois Univ., Urbana.

GEOMETRIC FIDELITY OF THREE SPACE TELEVISION SYSTEMS

K. W. Wong Oct. 1969 29 p Sponsored by NASA *Its* Civil Engr. Studies, Photogrammetry Ser. No. 25
(NASA-CR-110341) Avail: CFSTI CSCL 08B

In an attempt to establish the potential of space TV systems in photogrammetric mapping, an investigation was made to study the distortion characteristics of the three space TV systems; namely: ESSA 7, Surveyor 7 and Mariner 4. Author (USGRDR)

N70-30098# Dominion Observatory, Ottawa (Ontario).

ON THE DEPOSITION OF SEDIMENTS IN CRATERS, VOLUME 39, NO. 4

C. S. Beals and A. Hitchen 1970 16 p refs
Avail: CFSTI

Scale model experiments in sedimentation were carried out using a small artificial crater with a depth-to-diameter ratio corresponding to an impact crater a mile in diameter. The experiments were performed under deep water conditions using both mechanical and chemical means of deposition. The results indicated that the crater was obliterated after the deposition of a depth of sediments approximately three times the floor-to-rim depth of the crater. Since an impact crater of one mile diameter is about 800 feet deep, the experiments indicated that a crater of this size would be obliterated by sediments of very moderate depth (2400 feet). Profile studies of the model crater made during the process of sedimentary deposition, have revealed interesting analogies with the Holleford crater (known to be an ancient meteorite crater filled with Paleozoic sediments) and with the Mecatina crater, the origin and subsequent history of which are still uncertain. Author

N70-30164# Finnish Meteorological Office, Helsinki.

MAGNETIC RESULTS FROM NURMIJAERVI GEOPHYSICAL OBSERVATORY, 1968

1969 32 p
(Rept-10) Avail: CFSTI

Tabulated magnetic data are given for the intensities, declination, inclination, and components of the magnetic vectors. Data are also included for the mean values of the months, winter, equinox, summer, and year, together with hourly deviations from these mean values. J.M.C.

N70-30215*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

CARTOGRAPHIC APPLICATIONS OF ORBITAL PHOTOGRAPHY

Ronald G. Dalrymple Mar. 1970 97 p refs
(NASA-TM-X-63938; X-644-70-110) Avail: CFSTI CSCL 08B

Examples are given to illustrate the value of orbital photography in map revision. Examples are separated into three distinct but related categories: post-mapping changes (the most important), errors of portrayal, and errors of omission. This classification emphasizes the varied discrepancies encountered when comparing or, perhaps more appropriately, contrasting, photograph to map. Examples within each division are presented in a west to east progression, simulating the direction of flight of manned earth orbital spacecraft. The principal set of maps employed in this work are the AMS 1:1,000,000 Series 1301, which are most reliable maps with a workable scale for this type of study. Author

N70-30216# Hawaii Inst. of Geophysics, Honolulu.

HAWAII INSTITUTE OF GEOPHYSICS Annual Report, 1968 1969

Jul. 1969 136 p refs Supported in part by NSF and ESSA
Avail: Issuing Activity

Research progress is reported in geophysics, including aeronomy, geochemistry, geodesy, geology, meteorology, oceanography, soil genesis, solid earth geophysics, tsunamis, and underwater acoustics. R.B.

N70-30292# Imperial Coll. of Science and Technology, London (England). Dept. of Physics.

ORIGIN OF AURORAL PRIMARIES Final Scientific report, 1 Aug. 1966 30 Sep. 1969

James W. Dungey 30 Sep. 1969 17 p refs
(Contract AF 61(052)-927)
(AD-702467; AFCRL-70-0019) Avail: CFSTI CSCL 4/12

The theory of the neutral sheet in the geomagnetic tail has reached the point where noise should be taken into account. The problem of the sheet is formidable, but is tractable assuming it can be treated as a boundary layer. There is no fundamental need for noise to occur, but the distribution function derived from previous work suggests that noise whould be generated. Because the sheet is so thin, radiation out from the sides might quench the instability. It has been shown that this radiation can be calculated in a straightforward way and some computations have been published. A method has also been developed for calculating the energy fed into waves from particles. An approximate method of evaluation, valid for all but the longest wavelengths, yields reasonably simple formulae, and the application of this method to electrostatic waves is described. Once a self-consistent model of the noise-free sheet has been set up, these methods are sufficient to determine the nature of any noise generated. Author (TAB)

N70-30300# Translation Consultants, Ltd., Arlington, Va.

THE PACIFIC OCEAN. VOLUME 2: HYDROLOGY OF THE PACIFIC OCEAN, PART 2

A. D. Dobrovolsky, ed. 1969 361 p refs Transl. into ENGLISH of the book 'Tikhiy Okean. Gidrologiya Tikhogo Okeana' Moscow, Nauka, 1968 p 431 - 520 Prepared in cooperation with Bur. of Com. Fisheries,Seattle
(Contract N62306-69-C-0245)
(AD-700585; NOO-Trans-35-Vol-2-Pt-2) Avail: CFSTI CSCL 8/10

Contents: Seasonal sea level oscillations; Tides and tidal currents; Wave motion; Optical characteristics of the water; Ice. TAB

N70-30301# Translation Consultants, Ltd., Arlington, Va. Bureau of Commercial Fisheries, Seattle, Wash.

THE PACIFIC OCEAN. VOLUME 2: HYDROLOGY OF THE PACIFIC OCEAN, PART 1

V. G. Kort, ed. 1969 443 p refs Transl. into ENGLISH of the book 'Tikhiy Okean. Gidrologiya Tikhogo Okeana' Moscow, Nauka, 1968 p 1 - 430 Prepared in cooperation with Bur. of Com. Fisheries, Seattle
(Contract N62306-69-C-0245)
(AD-700584; NOO-Trans-35-Vol-2-Pt-1) Avail: CFSTI CSCL 8/10

Contents: The history of hydrological investigations and the material used; Water structure and water masses; Water structure and water masses; Water temperatures; Water salinity; Water density; Mixing; Water circulation. TAB

N70-30316# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SPECTROPHOTOMETRIC INVESTIGATIONS OF THE INTENSITY OF SCATTERED LIGHT

A. I. Ivanov 8 Jul. 1969 18 p refs Transl. into ENGLISH from Tr. Akad. Nauk Kazakhsk. SSR, Astrofiz. Inst. (Alma Ata), v. 8, 1967 p 113 - 121
(AD-701994; FTD-MT-24-61-69) Avail: CFSTI CSCL 4/1

Results of sky brightness observation in the visible spectral region with a given azimuthal and vertical pitch are presented for a wide range of atmospheric parameters. The brightness course is studied along various inclinations and verticals. The appearance of a point of minimum brightness is noted on the antisolar vertical. The color changes of the sky is also traced. Isophots of clear sky brightness are established. They are compared with theoretical calculations of several authors leading to the conclusion: theoretical results which take into account corrections for ozone absorption are very close to the observed brightness; however, for numerous atmospheric parameters the discrepancies are large and this is explained by discrepancies between the real and theoretically assumed, scattering functions; the author proposes that during calculations a less stretched-out scattering function be assigned to large optical masses. Author (TAB)

N70-30347# Dominion Observatory, Ottawa (Ontario)

TELLURIC HOURLY VALUES AND DC COMPONENT AT VICTORIA FOR 1966 - 1967, VOLUME 39, NO 3

D. R. Auld and B. Caner 1970 20 p refs
Avail: CFSTI

Only the telluric component in the magnetic north-south direction is provided. The hourly data contained in the tables were derived from strip-chart recordings at 20 mm/hr. The 'bucking' potentials of the DC component used to bring the recordings on scale were derived from calibrated sources. R.B.

N70-30349# Weapons Research Establishment, Salisbury (Australia).

IONOSPHERIC DATA FOR AUGUST 1968 FROM WOOMERA, SOUTH AUSTRALIA

Dec. 1969 26 p ref
(WRE-CPD-1968/8(W)) Avail: CFSTI

Tables of the hourly values of the customary ionospheric parameters are given for the station at Woomera for August 1968. Author

N70-30350# Oslo Univ. (Norway).

RELATION OF ELECTRON AND PROTON AURORAL MORPHOLOGY TO GEOMAGNETIC ACTIVITY

C. S. Deehr, T. A. Sten, A. Egeland, and A. Omholt Paris ESRO Dec. 1969 26 p refs
(ESRO-SN-107) Avail: CFSTI

Hydrogen and ionized nitrogen auroral emissions were measured by two photometers onboard the ESRO 1 Satellite and a description of the optical equipment is given. A statistical study of the relation between latitudinal changes in the electron and proton aurorae and gross geomagnetic activity represented by the planetary index, K sub p is discussed. It was found that the invariant latitude of the peak intensity of both the hydrogen and nitrogen emission decreased with increasing values of K sub p. The preliminary results showed that a plateau exists in the curve of invariant latitude versus K sub p for both the electron and proton aurorae. Author (ESRO)

N70-30398# Birmingham Univ. (England). Dept. of Electron Physics.

IMPROVED DIAGNOSTIC TECHNIQUES FOR MEASURING ELECTRON DENSITIES AND ELECTRON TEMPERATURES IN THE IONOSPHERE

C. V. Goodall and J. H. Wager 1970 11 p refs Presented at the Brit. Interplanet. Soc. Sounding Rocket Symp., Cardiff, Engl., Apr. 1970
Avail: CFSTI

The errors introduced by the space charge sheath on parallel plate capacitors used for ionospheric electron density experiments were reduced by use of long rectangular sensors. Errors arising from the contact potential differences between two Langmuir probes were reduced by colloidal graphite coatings. These developments were successfully tested on a Petrel rocket launched in February 1970 prior to use on the UK 4 satellite. ESRO

N70-30423 Danish Meteorological Inst., Charlottenlund.

MONTHLY SURFACE TEMPERATURES OF THE NORTHERN ATLANTIC, 50 - 80 DEG N, 0 - 60 DEG W, 1967 [MANEDLIGE OVERFLADETEMPERATURER I DET NORDLIGE ATLANTERHAV, 50 - 80 DEG N, 0 - 60 DEG W, 1967]

1969 28 p In ENGLISH and DANISH
Avail: CFSTI

Charts of the averages of observed temperatures and the number of observations are given for each month. N.E.N.

N70-30442# Weapons Research Establishment, Adelaide (Australia).

IONOSPHERIC DATA FOR JULY 1968 FROM WOOMERA, SOUTH AUSTRALIA

Jan. 1970 24 p ref
(WRE-SAD-1968/7(W)) Avail: CFSTI

Tables of the hourly values of the customary ionospheric parameters are given for the station at Woomera for July 1968. Author

N70-30472# Max-Planck-Institut fur Aeronomie, Lindau uber Northeim (West Germany).

A MESOSPHERE PAYLOAD TO MEASURE THE CONCENTRATION AND MOBILITY OF POSITIVE AND NEGATIVE IONS IN THE HEIGHT RANGE BETWEEN 82 AND 40 km

H. U. Widdel, G. Rose, and R. Borchers 1970 7 p Presented at the Brit. Interplanet. Soc. Symp. on Sounding Rockets, Cardiff, Engl., Apr. 1970 Sponsored by Ger. Federal Min. of Educ. and Sci.

Avail: CFSTI

A sonde for D region ejection from a sounding rocket having a parachute as aerodynamic brake is described. It contains an alphatron ionization gage, Gerdien condenser, electrometer, and flowmeter to measure the mobilities and concentrations of positive and negative ions. Results from an ESRO 1968 Centaur launching are discussed. ESRO

N70-30479# Dominion Observatory, Ottawa (Ontario).

RECORD OF OBSERVATIONS AT MEANOOK MAGNETIC OBSERVATORY, 1951 - 1952, VOLUME 83, NO. 3

H. E. Cook and Anne B. Cook 1970 107 p

Avail: CFSTI

Tabulated mean hourly values of horizontal intensity, vertical intensity, declination, and daily extremes are presented for the two year period. Data are also given on magnetic activity and ratios, and mean values for months for 1951 and 1952, and mean annual values for the 1917 - 1952 period. N.E.N.

N70-30512# Dominion Observatory, Ottawa (Ontario).

MAGNETIC ANOMALY MAPS OF THE NORDIC COUNTRIES AND THE GREENLAND AND NORWEGIAN SEAS, VOLUME 39, NO. 5

G. V. Haines, W. Hannaford, and P. H. Serson 1970 30 p refs

Avail: CFSTI

A three-component aeromagnetic survey of the Nordic countries and the Greenland and Norwegian seas was carried out in the fall of 1965. The survey data was processed to yield averages over one half minute of time, or roughly 3.5 km of flight track. A regional field, in the form of a third degree polynomial, was removed from the data, and the resulting 1/2-minute residuals were plotted by computer. These residuals are represented in three ways: as residual profiles, for each magnetic component; as two-dimensional vector residuals, in two orthogonal planes; and as segments of contour lines. Attention is drawn to several large anomaly systems, although no interpretation is attempted. Author

N70-30577*# Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.

TABLES OF REFRACTION CORRECTIONS FOR OBSERVATION OF OBJECTS IN THE EARTH'S ATMOSPHERE

I. G. Kolchinskiy et al *In its* Astrometry and Astrophys., No. 5 Jun. 1970 p 1 - 27 refs (See N70-30576 15-30)

Avail: CFSTI CSCL 04A

Tables of refraction angles for atmospheric objects are given. Calculations are made for standard atmospheric conditions. Author

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N70-29224 Minnesota Univ., Minneapolis.

THE DEVELOPMENT OF A MINIATURE SOLARIMETER AND ITS UTILITY IN TESTING LIGHT MODELS APPLIED TO SOYBEANS

Robert Kingsley Maxwell (Ph.D. Thesis) 1969 188 p

Avail: Univ. Microfilms: HC $8.60/Microfilm $3.00 Order No. 69-20037

The objectives were: (1) to design, build, and test a radiation sensor of sufficiently small size and high sensitivity that it is able to measure the downward and upward fluxes of solar radiation within a soybean canopy; and (2) to compare these measurements with the values predicted by the light models. With the additional measurements of net total radiation, diffusion resistance, and the gradients of temperature and water vapor next to a leaf, the total energy row crop model of Idso and Baker was tested. The thermopile was manufactured using photoetching techniques on 0.7-mil copper laminated to 5-mil epoxy glass, and by vacuum evaporating bismuth through a mask onto the etched laminate. A set of booms was assembled in order that the solarimeters could scan both parallel and perpendicular to the soybean rows. Dissert. Abstr.

N70-29334# Douglas United Nuclear, Inc., Richland, Wash.

A SELECTABLE LEVEL POCKET DOSE RATE ALARM DOSIMETER

G. L. Erickson 1 Jul. 1969 16 p refs

(Contract AT(45-1)-1857)

(DUN-5938) Avail: CFSTI

The design and calibration of a miniaturized pocket dose rate alarm dosimeter are described. The dosimeter uses a gamma-compensated G-M detector, and has selectable dose rate alarm points between 20 mR/hr and 50 R/hr. NSA

N70-29352# National Academy of Sciences-National Research Council, Washington, D.C. Advisory Committee to the Air Force Systems Command.

SYNTHETIC-APERTURE OPTICS. VOLUME 2: WOODS HOLE SUMMER STUDY, AUGUST 1967

1968 443 p refs

(Contract F18600-67-C-0071)

(AD-680797) Avail: CFSTI CSCL 20/6

Volume 2 contains 34 reports related to resolution of optical systems. Included are reports on interferometers, telescopes, lasers, radar, and optical images. TAB

N70-29363# Los Alamos Scientific Lab., N.Mex.

ANNOTATED BIBLIOGRAPHY OF POSSIBLE FALSE ASYMMETRIES AND THEIR CORRECTIONS IN EXPERIMENTAL MEASUREMENTS OF POLARIZATION ASYMMETRIES

David R. Waymire and Nelson Jarmie 22 Jan. 1970 12 p refs

(Contract W-7405-eng-36)

(LA-4235) Avail: CFSTI

An annotated list of 33 references is given concerning errors and false asymmetries in polarization and asymmetry measurements in nuclear physics. Highlights and important formulas are presented for each reference. Author (NSA)

N70-29370 National Lending Library for Science and Technology, Boston Spa (England).

PHOTOELECTRIC INSTRUMENT FOR MEASURING THE SPECTRA AND CONCENTRATIONS OF LIQUID AEROSOL PARTICLES

L. G. Akulshina et al 28 Nov. 1969 8 p refs Transl. into ENGLISH from Tr. Inst. Prik. Geof., Glav. Uprav. Gidromet. Sluzh. (Moscow), no. 1, 1967 p 41 - 48

(NLL-M-7953-(5828.4F)) Avail: Natl. Lending Library, Boston

Spa. Engl.: 1 NLL photocopy coupons

A photoelectric instrument, consisting of a transducer and a recording apparatus, designed for studying the microstructure of fogs in chambers is described. An analysis of the optical system, aerosol intake, recording apparatus and the circuits of the photomultiplier is presented. F.O.S.

N70-29378# Panametrics, Inc., Waltham, Mass.
ULTRASONIC THERMOMETRY IN LMFBR SYSTEMS Quarterly Progress Report, Oct. - Dec. 1969
E. P. Papadakis, D. R. Patch, L. C. Lynnworth, and E. H. Carnevale Jan. 1970 9 p refs
(Contract AT(30-1)-3906)
(NYO-3906-9) Avail: CFSTI

Progress in the development of an ultrasonic system to measure temperature in the coolant, cladding, and fuel of liquid metal-cooled fast breeder reactors is described. Details of the Bulk Shielding Reactor (BSR) test to determine gamma effects on a magnetostrictive transducer at high temperature are discussed, and the Oak Ridge Thermocouple (ORTC) test configuration is outlined. Also, plans for the fabrication and testing of an ultrasonic temperature sensor for an LMFBR fuel pin of the Fast Flux Test Facility (FFTF) type are indicated. NSA

N70-29386*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PHOTOHELIOGRAPH ALIGNMENT SYSTEM, NOVEMBER 1967 - JUNE 1968
L. M. Rosenberg 12 Aug. 1968 27 p
(Contract NAS7-100)
(NASA-CR-110243; JPL-750-11) Copyright. Avail: CFSTI CSCL 20F

The design and operation of an optical alignment system for use on the proposed photoheliograph is described. The optical alignment system has the following characteristics: (1) The telescope may be aligned while the telescope is in use and pointed at the sun. (2) It is operable by personnel that need not be optics specialists. (3) The alignment capabilities of the system are within the optical tolerances that have been defined by computer studies of an essentially diffraction-limited telescope. (4) Conventional design utilizing established technology makes the system adaptable to breadboard design techniques and the data obtained from an evaluation of the breadboard will apply directly to the proposed functional verification unit. Author

N70-29387*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PHOTOHELIOGRAPH FILM CAMERA DESIGN
G. Bastien 12 Aug. 1968 37 p refs
(Contract NAS7-100)
(NASA-CR-110242; JPL-750-12) Copyright. Avail: CFSTI CSCL 14E

Image recording in the photoheliograph may be either by TV or photographic films. Light energy histograms in UV (1500 to 3000A), white light (4000 to 6100A) and H-alpha (6563A) have demonstrated that images can be recorded with reasonable exposure times (less than 1/20 sec.) and on commercially available film. The advantages over TV are fast frame rates if required, finer resolution, and permanent record. The disadvantages are the limited total number of frames available, the need for Astronaut EVA to retrieve the film, possible radiation fogging, and the greater weight of the cameras. In order to minimize these disadvantages as compared to presently available cameras, to design a light weight, sealed camera with the following features: maximum film load (limited by weight); 70mm film for dual track 35mm recording to reduce spool size; and an automatically reversible film advance mechanism. Author

N70-29406# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
USE OF AN AIRCRAFT FOR MEASURING THE STATISTICAL DISTRIBUTION OF TURBULENCE [UTILISATION D'UN COMME MOYEN DE MESURE DE LA DISTRIBUTION STATISTIQUE DE LA TURBULENCE]
Gabriel Coupry and Guy Thomasset *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 refs In FRENCH; ENGLISH summary 14 p (See N70-29401 15-02)
Avail: CFSTI

A consistent method is provided for using velocity, gravity and height recordings, allowing the definition of mass measurements of atmospheric turbulence. This method is based on the calibration of the aircraft regarded as a turbulence measuring instrument and the theoretical methods of prediction are liable to considerable errors. It is shown that careful calibration, carried out on a few flights, makes it possible to measure with great accuracy the statistical distribution of turbulence, from the center of gravity accelerations. On the other hand, systematic research based on in-flight magnetic recording of pilot inputs leads to a technique which takes away, from the total acceleration, the part resulting from the pilot's actions. This overall research should lead to the development of a small size airborne velocity-gravity-height meter. Author

N70-29430# California Univ., Berkeley. Lawrence Radiation Lab.
STRAIN GAGES: POSTAGE STAMP STRESS ANALYZERS
Roland Krevitt Jan. 1970 28 p refs Presented at 2nd Western Res. and Develop. Safety Seminar, Berkeley, Calif.
(Contract W-7405-eng-48)
(UCRL-19432; Conf-700108-1) Avail: CFSTI

The theory, development, characteristics, and uses of bonded resistance strain gages are discussed. Several examples of applications such as on space vehicles, racing cars, and pressure vessels are described and illustrated. NSA

N70-29441# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
STUDY OF A SURFACE TEMPERATURE FLUXMETER FOR MEASUREMENTS IN A SHOCK-TUBE [ETUDE DU FLUXMETRE A TEMPERATURE SUPERFICIELLE POUR MESURES DANS LES TUBES A CHOC]
Jean Maulard 1969 108 p refs In FRENCH; ENGLISH summary
(ONERA-NT-139) Avail: CFSTI

The principle of this device is recalled and various theoretical calculations concerning this type of sensor are developed. Pieces of equipment based on this principle are described and results obtained in a shock-tube are presented as an example. The calibration methods are discussed and a new process, based on the use of a thermal radiation, is described and compared with the classical methods based on electric heating; a difficulty attached to these methods is pointed out, experimentally and through calculation. Certain phenomena relative to the use of thin films as resistance thermometers are also mentioned. Author

N70-29453*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PHOTOHELIOGRAPH STRUCTURE, MOUNTING, AND MECHANISMS, NOVEMBER 1967 - JUNE 1968
E. H. Rehnborg 12 Aug. 1968 128 p refs
(Contract NAS7-100)
(NASA-CR-110251; JPL-750-13) Copyright. Avail: CFSTI CSCL 17H

The basic telescope structure consists of a central truss-type housing which is mounted to the ATM spar. To this housing are attached demountable subassemblies containing the primary mirror and launch locks, the secondary mirror system and realignment mechanisms, and the camera-filter cluster. All components are checked for the maximum anticipated launch loads. This includes the basic structural members as well as the locks and clamps which immobilize and support the mechanisms during launch. Additionally, thermal analyses are performed for both operating and unusual conditions (such as dark-side standby, off-axis search for the sun, etc.). The results have, in certain cases, changed or modified the materials which were selected on the basis of loads and weights. Detailed design work is continuing with the object of early fabrication of critical components for environmental testing. Principally among these are the primary mirror mounting cell and the mechanisms for alignment and focus. Author

N70-29454*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

PHOTOHELIOGRAPH OPTICAL SYSTEM

Randolph A. Becker 12 Aug. 1968 109 p refs
(Contract NAS7-100)
(NASA-CR-110250; JPL-750-8) Copyright. Avail: CFSTI CSCL 17H

A modified Gregorian optical design was chosen for the ATM photoheliograph on the basis of thermal considerations. The primary mirror clear aperture for the f/50 design is 65 cm. The secondary obscuration ratio is only 0.2 of the diameter. Assuming no surface or alignment errors, the telescope would give essentially diffraction-limited performance across the 3.2 arc-minute field. Coma and astigmatism across this small field of view are negligible. Alignment errors and surface errors are expected to reduce performance to a Strehl ratio of 0.8. In-orbit realignment of the optical system is mandatory; therefore, an alignment subsystem, capable of being operated while the telescope is observing the sun, has been designed as an integral part of the optical system. The telescope will utilize 3 recorders; a UV camera (1500 to 3000A), a visible-light camera, and a hydrogen-alpha camera. A system resolution of approximately 0.2 arc seconds is expected at 5000 Angstroms. Author

N70-29478*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

RESEARCH ON ELECTROMAGNETIC CORRELATION TECHNIQUES Technical Memorandum, 1 Nov. 1968 - 1 Nov. 1969

Fritz R. Krause, ed. 17 Mar. 1970 215 p refs
(NASA-TM-X-64505) Avail: CFSTI CSCL 20F

Advanced data processing and statistical analysis methods were applied to output signals of active and passive electromagnetic sensors. Single path observations, intersecting beams, and separated lines of sight were used to study the overall level, spectroscopic structure, and motion of local and remote optical disturbances. The potential of the associated electromagnetic correlation techniques is illustrated by model experiments in a jet, in a glow discharge, and in a blow torch. Analytical concepts for remote probing of the earth's atmosphere are illustrated through a discussion of special cross-beam arrangements for ground wind and turbulence detection. Potential applications to the general problems of separating dispersion phenomena from local photochemical processes are introduced through a piecewide accumulation of phase and gain spectra. Author

N70-29479*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

INFRARED MEASUREMENTS OF SOUND SOURCE INTENSITIES IN JETS

L. N. Wilson (IIT Res. Inst., Chicago), F. R. Krause, and K. A. Kadrmas *In its* Res. on Electromagnetic Correlation Tech. 17 Mar. 1970 p 1 - 20 refs (See N70-29478 15-14)
Avail: CFSTI CSCL 20F

Direct measurements of local sound source intensities in turbulent jets were attempted using an optical cross-correlation technique. It has been shown that optical cross-beam measurements can be related directly to the volume integral describing the source strength. A study of this relationship is presented. The application and limitations of the technique are discussed in detail, with reference to Lighthill's and, in particular, Ribner's mathematical formulations. The latter formulation is particularly suited to cross-beam measurements since it expresses source strengths in terms of volume integrals of mass density fluctuations. Area integrals of density fluctuations were attempted using a new infrared cross-beam system. Progress on subsonic jets with this system shows promise of giving the desired density dependence. Measurements were made using the CO sub 2 absorption band at 4.3 microns. This type of measurement should be applicable to estimations of Mach-wave emission. Author

N70-29480*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

OPTICAL DETECTION OF MOVING STRIATIONS WITH THE CROSS-CORRELATION TECHNIQUE

J. B. Stephens and J. B. Thomison, Jr. *In its* Res. on Electromagnetic Correlation Tech. 17 Mar. 1970 p 21 - 41 refs (See N70-29478 15-14)
Avail: CFSTI CSCL 20F

Optical observations of emission variations in a plasma generated by a glow discharge were achieved using the cross-beam correlation technique. Classification of these emission variations at a point into periodic, narrow band, and random processes, is discussed, along with the identification of convection speeds and feedback loops of the system. Author

N70-29481*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

FEASIBILITY OF CROSSED-BEAM APPLICATIONS TO COMBUSTIVE FLOWS

J. B. Thomison, Jr. and J. B. Stephens *In its* Res. on Electromagnetic Correlation Tech. 17 Mar. 1970 p 43 - 53 refs (See N70-29478 15-14)
Avail: CFSTI CSCL 20F

Group velocities of local areas of combustion in a turbulent flame were optically measured by employing the crossed-beam correlation technique. Identification of velocity and photo-chemical reactions through correlation of emission fluctuations is discussed. Author

N70-29482*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

TURBULENCE MEASUREMENTS BY THE CROSSED-BEAM TECHNIQUE

M. Y. Su (Northrop Corp., Huntsville, Ala.) and F. R. Krause *In its* Res. on Electromagnetic Correlation Tech. 17 Mar. 1970 p 55 - 109 refs (See N70-29478 15-14)
Avail: CFSTI CSCL 20F

An analytical relationship which approximates the probability density of wind component variations through the cross-correlation of the passive photometer outputs of the cross-beam detection system is presented. Specifically, the probability density is shown to be proportional to the cross-correlation of the first time derivatives of the time histories of fluctuating radiation intensities which are monitored by two non-parallel photodetectors. The direction of the measured wind component is normal to both lines-of-sight of the photodetectors. Special data conditioning and handling methods for evaluating the cross-correlation of the signal time derivatives are described, and their effects on the cross-correlation and corresponding spectral densities are discussed. The new analytical relationship and data handling techniques were applied to actual atmospheric crossed-beam field test data. The reduced optically and remotely detected probability density of wind component variations was found to be in reasonable agreement with that obtained by the conventional anemometer readings. Turbulent intensity can be easily evaluated once the probability density is measured. Author

N70-29483*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ON THE TRANSFORMATION BETWEEN TRANSIT

DISTANCES AND WIND COMPONENT DISTRIBUTIONS

Fritz R. Krause *In its* Res. on Electromagnetic Correlation Tech. 17 Mar. 1970 p 111–123 refs (See N70-29478 15-14)
Avail: CFSTI CSCL 20F

Analytical studies of multibeam geometries were initiated to determine whether suitable test geometries could be found which do not require independent wind direction readings for relating transit times to wind components. Physical arguments are presented that wind components may be uniquely determined with a simple two-telescope arrangement if a plurality of photodetectors is used in the focal plane of one telescope to monitor transit distances instead of transit times. The use of a third or fourth telescope and the restrictions on wind azimuth are not necessary, if the measurement objectives are to measure one wind component rather than two or three. Author

N70-29484*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

CROSS-POWER SPECTRAL ANALYSIS FOR ATMOSPHERIC CROSS-BEAM DATA

J. Briscoe Stephens, John M. Locklin, and John C. Pooley (Northrop Corp., Huntsville, Ala.) *In its* Res. on Electromagnetic Correlation Tech. 17 Mar. 1970 p 125–137 refs (See N70-29478 15-14)
Avail: CFSTI CSCL 20F

An attempt was made to physically interpret cross-beam atmospheric results using spectral analysis. The cross-beam program used just the time domain for the retrieval of wind velocity information. While the spectral formulation applied to this analysis is not new, the method of combining is new. The concept of a piecewise spectrum is introduced, along with the statistical error of the spectrum. These concepts are analyzed and applied to actual cross-beam data. Author

N70-29502# Oak Ridge National Lab., Tenn.

AN ALIGNMENT PROCEDURE FOR THE KRATKY SMALL-ANGLE X-RAY CAMERA

J. W. Anderegg, P. G. Mardon, and R. W. Hendricks Feb. 1970 24 p refs
(Contract W-7405-eng-26)
(ORNL-4476) Avail: CFSTI

A precision alignment procedure was developed for the Kratky small-angle x-ray camera. This method uses only proportional counter to measure the x-ray intensity distribution in the incident beam, as opposed to other methods which require fluorescent screens and x-ray film. During the progress of this work, two useful auxiliary alignment slits were also developed. Their use is described in detail. The roles of previously developed vacuum bellows seals and a diffracted beam graphite monochromator in the alignment procedure are discussed. Author (NSA)

N70-29511*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

PHOTOHELIOGRAPH FUNCTIONAL VERIFICATION UNIT TEST AND OPERATIONS PLAN, NOVEMBER 1967 –JUNE 1968

J. E. Maclay 12 Aug. 1968 29 p refs
(Contract NAS7-100)
(NASA-CR-110244; JPL-750-15) Avail: CFSTI CSCL 17H

The testing to be performed on the Functional Verification Unit (FVU) Photoheliograph in the telescope test facility is described. The test facility description, a general instrument description and a general discussion of the optical test method are also included. Author

N70-29524# Rensselaer Polytechnic Inst., Troy, N.Y.

NANOSECOND TIMING FOR A LARGE LIQUID SCINTILLATOR

R. W. Hockenbury and W. R. Moyer [1969] 9 p refs
(Contract AT(30-3)-328)
(RPI-328-175) Avail: CFSTI

A description is given of the fast-slow coincidence system now used with a 1.25 meter liquid scintillation detector for keV neutron capture measurements at the Rensselaer Linac Laboratory. Author (NSA)

N70-29526# California Univ., Livermore. Lawrence Radiation Lab.

A "WINDOWLESS" MACRO-CAMERA FOR HOT-CELL USE

E. D. Albrecht, J. M. Johnson, and E. H. Stearns 2 Jul. 1969 8 p Submitted for publication Sponsored by AEC
(UCRL-71561; Conf-691102-15) Avail: CFSTI

A macro-camera having a magnification capability from 2 to 30× has been designed and built for use in a beta gamma hot cell facility. Specimens and parts up to 10 curies and no larger than 2 in. × 2 1/2 in. in size can be photographed. The camera assembly is mounted on the cell roof and inserted into the cell through a sliding lead door prior to use. A remotely operated stage, permanently installed within the cell, provides accurate specimen positioning via x, y, and z motions. Author (NSA)

N70-29537*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

PHOTOHELIOGRAPH PRIMARY MIRROR DEVELOPMENT, NOVEMBER 1967 –JUNE 1968

R. F. Freeman, C. D. Porter, and H. H. Mu 12 Aug. 1968 159 p ref
(Contract NAS7-100)
(NASA-CR-110246; JPL-750-7) Avail: CFSTI CSCL 17H

The design, materials selection, and functional requirements of the photoheliograph primary mirror for the Apollo telescope mount are detailed. In addition, the analytical efforts on the structural and thermal analyses of the primary mirror are summarized. D.L.G.

N70-29549# National Bureau of Standards, Washington, D.C. Information Processing Technology Div.

A SELECTIVE ROLL-TO-ROLL PRINTER FOR PRODUCING DUPLICATE MICROFILM COPIES

James N. Strohlein and Thomas C. Bagg Feb. 1970 12 p
(PB-189458; NBS-TN-516) Avail: CFSTI; SOD $0.25 CSCL 14E

The Selectaframe printer, a device for copying onto roll film selected frames from other rolls of film for subsequent automatic enlargement printing, is described. Author (USGRDR)

N70-29552# National Bureau of Standards, Washington, D.C.

PRECISION MEASUREMENT AND CALIBRATION: SELECTED NBS PAPERS ON TEMPERATURE

J. F. Swindells, ed. Aug. 1968 513 p refs
(NBS-SPEC-PUBL-300-VOL-2) Avail: SOD $4.75

Papers are presented on calibration uncertainties, temperature scales, resistance thermometers, thermoelectric thermometry, liquid-in-glass thermometry, optical pyrometry, and spectroscopic thermometry. Selected bibliographies for the period January 1953 through December 1965 are included. For individual titles see N70-29553 through N70-29588.

N70-29556# National Bureau of Standards, Washington, D.C.

THE REALIZATION AND USE OF THE INTERNATIONAL PRACTICAL TEMPERATURE SCALE OF 1948

John P. Evans *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 6 p refs Reprinted (See N70-29552 15-14)
Avail: SOD $4.75

The temperature scale, the methods and accuracy with which it is realized, and the current efforts being made to improve the scale are described. Methods of transferring the scale to temperature measuring instruments are also discussed. Author

N70-29556# National Bureau of Standards, Washington, D.C.

ESTABLISHMENT OF A TEMPERATURE SCALE FOR THE CALIBRATION OF THERMOMETERS BETWEEN 14 AND 83 K

Harold J. Hoge and Ferdinand G. Brickwedde *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 23 p refs Reprinted (See N70-29552 15-14)
Avail: SOD $4.75

Seven resitance thermometers (six Pt; one 90Pt:10Rh alloy) were calibrated on the thermodynamic scale by comparison with a helium gas thermometer. The boiling point of oxygen was taken to be 90.19 K, and computations were made in such a way as to secure continuity between the International Temperature Scale and the scale being established. On the latter scale the triple point of normal hydrogen was found to be 13.96 K and the boiling point 20.39 K. Tables were prepared by means of which temperatures corresponding to observed resistances may be obtained by linear interpolation. Author

N70-29557# National Bureau of Standards, Washington, D.C.

CORRECTIONS FOR USE IN LOW-TEMPERATURE PLATINUM RESISTANCE THERMOMETRY

In its Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 1 p ref Reprinted (See N70-29552 15-14)
Avail: SOD $4.75

Corrections are given for use with thermometers calibrated at liquid oxygen temperature as one point but used to calibrate other thermometers using liquid nitrogen temperature. The corrections are tabulated for the 90 K to 50 K temperature range. N.E.N.

N70-29558# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.

ACOUSTICAL THERMOMETER AND THE NATIONAL BUREAU OF STANDARDS PROVISIONAL TEMPERATURE SCALE 2 - 20 (1965)

Harmon H Plumb and George Cataland *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 13 p refs Repr. from Metrologia (Berlin), v. 2, no. 4, Oct. 1966 p 127 - 139 (See N70-29552 15-14)
Avail: SOD $4.75

An acoustical thermometer was developed to determine values of temperature that approximate the thermodynamic temperature scale. The instrument, called an ultrasonic interferometer was used to determine isotherms of the speed of sound in helium gas as a function of pressure. Each isotherm was extrapolated to zero pressure to approximate the condition of an ideal gas; from the resulting intercepts, values of temperature were calculated. The instrument and its operation are described and the data isotherms, which determined at approximately every degree from 2 - 20 K, are listed. The isotherm data were treated both graphically and by electronic computer analysis (by the method of least squares) to yield values of temperature that are the basis for a new temperature scale. When the scale is compared with other existing scales in regions of overlap, the agreement with NBS (1955) is excellent but noticeable departures from the helium-4 vapor pressure scale are indicated. Author

N70-29562# National Bureau of Standards, Washington, D.C.

PRECISION RESISTANCE THERMOMETRY AND FIXED POINTS

H. F. Stimson *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 28 p refs Reprinted (See N70-29552 15-14)
Avail: SOD $4.75

Apparatus and techniques to improve the accuracy of resistance thermometers are discussed. Equipment is described to achieve the fixed points: the triple point of water, steam point, sulfur boiling point, and oxygen boiling point. Improvements in the platinum resistance thermometer and techniques for their precision determinations are reviewed. It is felt that increased precision is achieved by attention to measurement techniques and instrument designs. N.E.N.

N70-29563# National Bureau of Standards, Washington, D.C.

NOTES TO SUPPLEMENT RESISTANCE THERMOMETER REPORTS

In its Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 10 p ref (See N70-29552 15-14)
Avail: SOD $4.75

Notes to supplement calibration reports for platinum resistance thermometers are presented. Interpolation formulas are given for the temperature scale, and techniques for measuring the resistance of the platinum are discussed. The advantages of using the resistance ratio tables is pointed out, and a method of calibrating a Mueller-type bridge is given. N.E.N.

N70-29564# National Bureau of Standards, Washington, D.C.

CONSTANTS OF THE INTERPOLATION FORMULA FOR PLATINUM RESISTANCE THERMOMETERS

J. L. Riddle *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 4 p refs Presented at the 6th Session of the Advisory Comm. on Thermometry to the Intern. Bur. of Weights and Meas., Sep. 1962 (See N70-29552 15-14)
Avail: SOD $4.75

Values of the constants in the interpolation formula for a large number of thermometers recently submitted for calibration are summarized. All thermometers suitable as standards which were received over a period of about one year during 1959 and 1960 are included. Limitations on such constants can serve either to make the International Practical Temperature Scale more precisely defined or to reduce the number of calibration points required for application over limited temperature ranges. Author

N70-29565# National Bureau of Standards, Washington, D.C.

A STUDY OF STABILITY OF HIGH TEMPERATURE PLATINUM RESISTANCE THERMOMETERS

J. P. Evans and G. W. Burns *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 6 p refs Repr. from Temp., Its Meas. and Control in Sci. and Ind., v. 3, pt. 1, 1962 (See N70-29565 15-14)
Avail: SOD $4.75

Thermometer stability is indicated by the ratio of the resistance of 100 C to the resistance at 0 C, and the results of heat treatments on the ratio are discussed. It was noticed that after initial annealing the ratio decreased slowly with heating but is not strongly dependent on the heating temperature. It was also found that heating a thermometer for a second time at a lower temperature produces a recovery in the ratio. Upon further heating at a higher temperature, the ratio returns to its lower value. The difference between the two resistances for at least one thermometer remained essentially unchanged throughout the experiments, and it is suggested that the changes in resistance produced by cooling obey Matthiessen's. Data show that thermometer stability is dependent on the cooling rate. Both annealing prior to low temperature determinations and rapid cooling reestablish the initial ratio value, and annealing is the preferred method. N.E.N.

N70-29566# National Bureau of Standards, Boulder, Colo. Cryogenic Engineering Lab.

INTERPOLATION OF PLATINUM RESISTANCE THERMOMETERS, 10 TO 273.15 K

Robert J. Corruccini *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 9 p Repr. from Temp., Its Meas. and Control in Sci. and Ind., v. 3, pt. 1, 1962 (See N70-29552 15-14)
Avail: SOD $4.75

A numerical method is developed for interpolating the resistance-temperature relations by utilizing similarities in the form of their departures from Matthiessen's rule. The thermometers are calibrated at three temperatures, and the interpolation is carried out by using detailed tables of the resistance-temperatures relations of two other thermometers. The thermometers are described, and results of the interpolations for various temperatures are graphed and discussed. It is concluded that the interpolation method is feasible for calibrating resistance thermometers in the United States because of the wide use of the particular type of thermometer used in the study. The method may provide a means for extending the International Temperature Scale below 90.18 K. Author

N70-29567# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.

CALIBRATION OF GERMANIUM RESISTORS AT LOW TEMPERATURES (2 – 20 KELVIN)

G. Cataland and H. H. Plumb *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 10 p refs Repr. from J. Res. Natl. Bur. Std., A. Phys. and Chem., v. 70A, no. 3, May – Jun. 1966
Avail: SOD $4.75

Two germanium resistors, C and D, were referenced to values of temperature determined by the acoustical thermometer. The resistance-temperature calibration data for these resistors were fitted to a log function and the results are presented. The resistors C and D that are used as secondary standards maintain the scale to which public calibrations of germanium thermometers are referenced. The calibration apparatus and measurement techniques that are employed in calibrating submitted resistors are described in detail. Additionally, data of three typical calibrations and their treatment by polynomial fitting are included to demonstrate the characteristics of some commercially available germanium resistors. Author

N70-29568# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.

REPRODUCIBILITY OF GERMANIUM RESISTANCE THERMOMETERS AT 4.2 K

M. H. Edlow and H. H. Plumb *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 10 p refs Repr. from J. Res. Natl. Bur. Std., C. Eng. and Instrumentation, v. 70C, no. 4, Oct. – Dec. 1966 (See N70-29552 15-14)
Avail: SOD $4.75

A procedure is described for selecting a set of very reproducible germanium resistors that would be capable of maintaining temperature scales. A group of germanium resistors from three commercial sources were thermally cycled between 4.2 K and room temperature. The resistance-temperature calibrations at 4.2 K were made with reference to a liquid helium bath so that reproducible temperatures could be determined from liquid helium vapor pressure measurements. Seven resistors out of 25 demonstrated reproducibilities (of the 4.2 K calibration) of about 0.001 K after undergoing the multiple cyclings. Guided by these results, twelve new similar resistors were cycled in a comparable procedure. After 85 cycles, in which 14 resistance-temperature calibrations were performed at 4.2 K for each resistor, 10 of the 12 resistors demonstrated reproducibilities of approximately 0.001 K. The resulting set of secondary thermometers have undergone calibration in the temperature ranges, 2 to 5 K and 2 to 20 K; reports of this work will be published in the near future. Author

N70-29569# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.

GERMANIUM RESISTANCE THERMOMETRY IN THE RANGE 2.1 TO 5.0 K

M. H. Edlow and H. H. Plumb *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 13 p refs Repr. from J. Res. Natl. Bur. Stds., C. Eng. and Instrumentation, v. 71C, no. 1, Jan. – Mar. 1967 (See N70-29552 15-14)
Avail: SOD $4.75

The resistances of three encapsulated, hermetically sealed, arsenic-doped germanium resistors from a commercial source were measured at every 0.1 K from 2.1 to 5.0 K in highly stabilized liquid helium baths; values of temperature were derived from vapor pressure measurements associated with the liquid bath. Ten similar germanium resistors of common origin were calibrated from 2.1 to 5.0 K in a calibration comparator apparatus that is similar to a calorimeter in design. Calibrations were performed against a resistor that had been previously referenced to temperature through a helium-4 vapor pressure calibration. Next, three of the resistors that were calibrated in the comparator apparatus were recalibrated in a liquid helium bath (at 2.2, 3.0, and 4.2 K) and results from the two methods agree within + or – 1 millidegree. The resistance-temperature data from both methods were fitted to the polynomial equation log and the results of a computer program, which evaluates the coefficients, are presented. Author

N70-29570# National Bureau of Standards, Washington, D.C.

THERMOELECTRIC THERMOMETRY

William F. Roeser *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 20 p refs Repr. from J. Appl. Phys., v. 11, no. 6, Jun. 1940 p 388 – 404 Presented at the Am. Inst. of Phys. Symp. on Temp., Its Meas. and Control in Sci. and Ind., 4 Nov. 1939 (See N70-29552 15-14)
Avail: SOD $4.75

The fundamental laws and theories of thermoelectric phenomena and their historical development as well as the application of these phenomena to the measurement of temperature are discussed in considerable detail. Thermoelectric thermometry, with particular regard to types of thermocouples, protection of thermocouples, and fundamental considerations in temperature measurements are treated primarily from the practical standpoint. Author

N70-29571# National Bureau of Standards, Washington, D.C.

METHODS OF TESTING THERMOCOUPLES AND THERMOCOUPLE MATERIALS

William F. Roeser and S. T. Lonberger *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 23 p refs Reprinted (See N70-29552 15-14)
Supersedes NBS-RP-78
(NBS-CIRC-590; NBS-RP-768) Avail: SOD $4.75

Various methods used for testing thermocouples and thermocouple materials and the precautions that must be observed in order to attain various degrees of accuracy are described. In particular, the methods that were developed and used at the National Bureau of Standards are outlined in detail, and some guidance is given in the selection of the method best adapted to a given set of conditions. Consideration is given primarily to the calibration of platinum versus platinum-rhodium, copper-constantan, Chromel-Alumel, and iron-constantan thermocouples. Author

N70-29572# National Bureau of Standards, Washington, D.C.

TEMPERATURES OF THERMOCOUPLE REFERENCE JUNCTIONS IN AN ICE BATH

Frank R. Caldwell *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 7 p refs Repr. from J. Res. Natl. Bur. Stds., C. Eng. and Instrumentation, v. 69C, no. 2, Apr. – Jun. 1965 (See N70-29552 15-14)
Avail: SOD $4.75

Errors obtained when using several sizes of ISA Type K thermocouple wires (14 to 20 AWG) and of copper lead wires (14 to 26 AWG) at different immersions in a properly prepared and maintained ice bath are given. Variables considered include in addition to the wire diameters and materials, depth of immersion (2 to 9 in.), solid cross section of the Pyrex junction tubes, and type of insulation on the copper lead wires. The wires studied represent the maximum (copper) and the minimum (Chromel) thermal conductivities of any of the normally used thermocouple wires. A small amount of data on platinum is included. Depth of immersion and diameter of the copper wire are extremely important if a high degree of accuracy is to be attained. The solid cross section of the Pyrex junction tubes and type of insulation used are of lesser importance. Author

N70-29573# National Bureau of Standards, Washington, D.C.

STABILITY OF BASE-METAL THERMOCOUPLES IN AIR FROM 800 TO 2,200 F

Andrew I. Dahl *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 27 p refs Reprinted (See N70-29552 15-14)

Avail: SOD $4.75

A study was made of the changes in the emf of Chromel-Alumel and iron-constantan thermocouples heated in an oxidizing atmosphere at various temperatures and for various periods of time. The thermocouples were held at definite temperatures, ranging from 800 to 2200 F, in steps of 200 F. Calibrations were made of the thermocouples in their original condition, and again after heating them at each temperature for total times of 10, 50, 100, 200, 400, 600, 800, and 1000 hours, or as long as the thermocouples remained serviceable. The thermal emf of each element against platinum was measured in order to determine the relative stability of the individual elements. A few tests were made to determine the effect of wire size on the stability. The effects of changing the depth of immersion of thermocouples after they had been used under controlled conditions were also studied. Author

N70-29574# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.

REFERENCE TABLES FOR THE PT-30 PERCENT RH VERSUS PT-6 PERCENT RH THERMOCOUPLE

George W. Burns and John S. Gallagher *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 17 p Repr. from J. Res. Natl. Bur. Stds., C. Eng. and Instrumentation, v. 70C, no. 2, Apr – Jun 1966 (See N70-29552 15-14)

Avail: SOD $4.75

Reference tables for the thermocouple were established for the range 0 to 1820 C based upon the calibrations of thermocouples furnished by three manufacturers in the United States and by one European manufacturer. The thermocouples were calibrated by comparison with standard instruments such as platinum resistance thermometers, platinum-10 percent rhodium versus platinum thermocouples and optical pyrometers. The test procedures and facilities used for the calibrations are described and the accuracy of the measurements is discussed. The platinum-rhodium elements of the thermocouples were examined by a general qualitative spectrochemical method and the results of the analyses are given. Tables of emf of the individual elements of the thermocouple versus Pt-27 for the range 0 to 1500 C are also presented. In addition, the effect of variations in the alloying percentages of platinum and rhodium on the temperature-emf relationships of the elements are shown. The results of calibrations for other Pt-30 percent Rh versus Pt-6 percent Rh thermocouples, which were received for routine calibration during the period from May 1963 to March 1965, are also shown. Author

N70-29575# National Bureau of Standards, Washington, D.C.

REFERENCE TABLES FOR 40 PERCENT IRIDIUM-60 PERCENT RHODIUM VERSUS IRIDIUM THERMOCOUPLES

G. F. Blackburn and F. R. Caldwell *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 (See N70-29552 15-14) 6 p refs Repr. from J. Res. Natl. Bur. Stds., C. Eng. and instrumentation, v. 66C, no. 1, Jan.–Mar. 1962 Presented at the 4th Symp. on Temp., Its Meas. and Control in Sci. and Ind., Columbus, Ohio, 27–31 Mar. 1961

Avail: SOD $4.75

Tables have been prepared giving emfs for temperatures in degrees Fahrenheit from 32°F to 3800°F and in degrees Celsius from 0°C to 2100°C, and temperatures in these units with emf in millivolts as the argument. The emf is 11.6 millivolts at 3800°F. The thermoelectric power averages 3.1 microvolts per deg F, and is within 0.1 microvolt of this value between 500°F and 300°F. It increases somewhat at temperatures above 3000°F. Measurements at temperatures 32°F to 2500°F were made in a platinum-wound furnace of conventional design, using a Pt-10 percent Rh versus Pt thermocouple to measure temperature. From 1950°F to 3800°F, the furnace used was an iridium block heated by electric induction. Blackbody conditions prevailed in the cavity in which the test thermocouple was inserted, and enabled measurement of the temperature with an optical pyrometer. Good agreement between the data obtained in the overlapping parts of the platinum and optical pyrometer ranges established confidence in the temperature measurements with the optical pyrometer above 2500°F. The accuracy of the measurements is largely that associated with the optical pyrometer. The maximum uncertainties in the range 2500°F to 3800°F are believed to range from about 8°F to 12°F. Author

N70-29577# National Bureau of Standards, Washington, D.C.

LOW TEMPERATURE THERMOCOUPLES. PART 1: GOLD-COBALT OR CONSTANTAN VERSUS COPPER OR NORMAL SILVER

R. L. Powell, M. D. Bunch, and R. J. Corruccini

In its Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 13 p refs Repr. from Cryogenics, v. 1, no 3, 1961 (See N70-29552 15-14)

Avail: SOD $4.75

The apparatus for studying and calibrating thermocouples is described, and data are given on the thermoelectric properties of three alloys: gold-cobalt (gold-2.1 at. % cobalt, constantan, and normal silver (silver-0.37 at. % gold). For precise work two precautions are necessary to reduce the effects of inhomogeneities: A reference junction should be as close thermally to the variable junction as possible, and alloy wires should not be taken through regions where the temperature is greatly different from either junction or where there are large temperature gradients. It is important to spot-calibrate each sample of gold-cobalt and of constantan for work below 80 K. Copper and normal silver have approximately the same absolute thermoelectric power; both are useful in conjunction with gold-cobalt or constantan. In general, copper is preferred above 80 K and normal silver below 80 K where heat leaks can be important. Author

N70-29578# National Bureau of Standards, Washington, D.C.

CALIBRATION OF LIQUID-IN-GLASS THERMOMETERS

James F. Swindells *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug 1968 27 p refs Reprinted (See N70-29552 15-14) Supersedes NBS-CIRC-600 (NBS-MONOGRAPH-90; NBS-CIRC-600) Avail: SOD $4.75

Information is presented of general interest to both manufacturers and users of liquid-in-glass thermometers, as well as those who wish to calibrate thermometers or submit them for calibration. Instructions are provided for applicants requesting calibration services, and the techniques and equipment used in the calibration procedures are described. Important elements of thermometer design are discussed, and factors affecting the use of common types of liquid-in-glass thermometers are included together with tables of tolerances and reasonably attainable accuracies. The calculation of corrections for the temperature of the emergent stem is given in detail for various types of thermometers and conditions of use. Author

N70-29579# National Bureau of Standards, Washington, D.C.

THEORY AND METHODS OF OPTICAL PYROMETRY

H. J. Kostkowski and R. D. Lee *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 30 p refs Reprinted (See N70-29552 15-14)

(NBS-MONOGRAPH-41) Avail: SOD $4.75

A detailed review of the theoretical methods of optical pyrometry and the application of these methods in realizing, maintaining, and distributing the International Practical Temperature Scale above 1063 C is presented. In the theoretical presentation, the concepts of effective and mean effective wavelengths are introduced, and various equations relating these parameters to each other and other physical quantities are derived. The important features of precision visual optical pyrometers are discussed and a number of blackbody sources and tungsten strip lamps described. Detailed experimental procedures and results of primary and secondary calibrations of optical pyrometers at NBS are given. Finally, recommendations for achieving high precision and accuracy and the fundamental limitations in visual optical pyrometry are presented. Author

N70-29580# National Bureau of Standards, Washington, D.C.

THE NBS PHOTOELECTRIC PYROMETER AND ITS USE IN REALIZING THE INTERNATIONAL PRACTICAL TEMPERATURE SCALE ABOVE 1063 C

R. D. Lee *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 13 p refs Repr. from Metrologia (Berlin), v. 2, no. 4, Oct. 1966 p 150-162 (See N70-29552 15-14)
Avail: SOD $4.75

A photoelectric pyrometer was developed with which the International Practical Temperature Scale above the gold point, 1063 C, is realized about 5 times more accurately than with the prevalently used disappearing filament visual pyrometer. Estimated standard deviation uncertainties of realizing the IPTS with the photoelectric instrument are 0.06 C at 1063 C, 0.12 C at 1256 C, 0.27 C at 1650 C, 0.7 C at 2330 C, and 2 C at 3525 C. The design, evaluation, and calibration to realize the IPTS are discussed. Author

N70-29582# National Bureau of Standards, Washington, D.C.

SPECTRAL ABSORPTION METHOD FOR DETERMINING POPULATION TEMPERATURES IN HOT GASES

Henry J. Kostkowski and Herbert P. Broida *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 9 p refs Repr. from J. Opt. Soc. Am., v. 46, no. 4, Apr. 1956 p 246-254 (See N70-29552 15-14)
Avail: SOD $4.75

A spectroscopic method, useful for strongly absorbed lines, was investigated for measuring temperatures of hot gases. The minimum transmission of discrete spectral lines in gases at equilibrium has a simple dependence upon the absolute temperature and this relation is used to measure temperature from a straight line plot. An experimental study was made of the absorption due to the rotational lines of OH between 3067 and 3090 A in an oxygen-acetylene flame. It is shown that temperatures measured by this method are less affected than the conventional one by lack of sufficient resolving power, flame thickness, and various light sources (either continuous or line). Author

N70-29583# National Bureau of Standards, Washington, D.C.

MEASUREMENT OF ELECTRON DENSITY AND TEMPERATURE IN DENSE PLASMAS BY APPLICATION OF LINE BROADENING THEORY

J. B. Shumaker, Jr. and W. L. Wiese *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 5 p refs Repr. from Temp., its Meas. and Control in Sci. and Ind., v. 3, pt. 1, 1962 (See N70-29552 15-14)
Avail: SOD $4.75

Line profile measurements are applied to the diagnostics of arc plasmas into which a trace of hydrogen is added. The electron density is obtained directly from the line profile theory, but the temperature must be calculated from the electron density in cases of local thermodynamic equilibrium (LTE) by solution of plasma conservation and equilibrium equations. The results indicate that electron densities accurate to 10% or 15% can easily be obtained. No knowledge of the amount of hydrogen present is required, and the application of the technique is independent of the presence of LTE. The method is of particular advantage in those cases where the hydrogen negligibly affects the plasma and is present in small concentrations. The hydrogen then behaves as a true thermometer. Author

N70-29586# National Bureau of Standards, Washington, D.C.

THE USE OF AN ANALOG COMPUTER IN SIDE-ON ARC SPECTROSCOPY

J. B. Shumaker, Jr. and C. R. Yokley *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 6 p refs Repr. from Appl. Opt., v. 3, Jan. 1964 p 83 (See N70-29552 15-14)
Avail: SOD $4.75

An analog computer which solves Abel's integral equation is described and its application to the side-on spectroscopic study of high current arcs is illustrated. By its use radially resolved spectra of cylindrically symmetric inhomogeneous sources are obtained with the same speed and simplicity as are spectra of homogeneous sources. Comparison of N I transition probability measurements using this computer with those using conventional numerical radial resolution techniques indicates that the computer errors are negligible. Author

N70-29587# National Bureau of Standards, Washington, D.C.

BIBLIOGRAPHY OF TEMPERATURE MEASUREMENT, JANUARY 1953 - JUNE 1960

Carl Halpern and Robert J. Moffat *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 15 p refs Reprinted (See N70-29552 15-14)
(NBS-MONOGRAPH-27) Avail: SOD $4.75

There are presented more than 500 references to the field of temperature measurement. These references were collected from two general sources: Scientific and technical literature and government reports. For convenience of the user, the references are divided into a number of categories based on the type of instrument used. Some references to calibration of instruments and to scientific theories, on which temperature measurement is based, are also presented. Author

N70-29588# National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.

BIBLIOGRAPHY OF TEMPERATURE MEASUREMENT, JULY 1960 - DECEMBER 1965

Lief O. Olsen and Carl Halpern *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 49 p refs Reprinted (See N70-29552 15-14)
(NBS-MONOGRAPH-27) Avail: SOD $4.75

There are presented in this supplement about 700 additional references. The arrangement of material is the same as in the earlier bibliography. Author

N70-29598# Rensselaer Polytechnic Inst., Troy, N.Y.

NEUTRON INELASTIC SCATTERING MEASUREMENTS WITH A GATED PHOTOMULTIPLIER

R. R. Fullwood and R. W. Hockenbury [1969] 13 p
(Contract AT(30-3)-328)
(RPI-328-176) Avail: CFSTI

Neutron inelastic scattering measurements have been made on iron samples from 0.8 to 15 MeV using a gated photomultiplier mounted on a NaI-crystal. The transistorized gating technique may also be applied to other scintillation detector experiments where the accelerator beam flash would otherwise limit the experiment. Author (NSA)

N70-29601# Addis Translations International, Woodside, Calif.

THE ACCURACY AND RELIABILITY OF ROUGHNESS MEASUREMENTS

H. von Weingraber Oct. 1969 44 p refs Transl. into ENGLISH from Ann. of the CIRP, v. 17, 1969 p 124, 1–14 Transl. for Calif. Univ., Livermore. Lawrence Radiation Lab.
(PB-188141T; UCRL-Trans-10398) Avail: CFSTI CSCL 14B

Various investigations of the subcommittee, and the OECD-Group of Experts surface quality control have shown that the roughness values indicated by surface roughness measuring instruments of the same type as well as those of different types scattered very much in spite of careful calibration. It is demonstrated that these deviations are based to a great extent on the uncertainty of the calibration operation itself. Further, the deviations caused by the peculiarities of the different types of roughness measuring instruments are considered. The question as to what precision and reliability of the surface roughness measuring instruments must be required is treated. Author (USGRDR)

N70-29611# Dartmouth Coll., Hanover, N.H. Thayer School of Engineering.

EXPERIENCE WITH THE WICKS-DUKLER PROBE FOR MEASURING DROP SIZE DISTRIBUTIONS IN SPRAYS

Stephen S. MacVean and Graham B. Wallis Dec. 1969 35 p refs Sponsored in part by Ford Motor Co.
(Grant NSF GK-1841)
(PB-189684) Avail: CFSTI CSCL 14B

Advantages and disadvantages are reported in the use of the Wicks-Dukler probe. USGRDR

N70-29616*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

PHOTOHELIOGRAPH REQUIREMENTS FOR A SPECTROGRAPH, NOVEMBER 1967 – JUNE 1968

S. E. Persson 12 Aug. 1968 35 p refs
(Contract NAS7-100)
(NASA-CR-110247; JPL-750-14) Avail: CFSTI CSCL 20F

The spectrograph requirements and constraints for the ATM photoheliograph are described. Qualitative considerations include compatibility with spacecraft and telescope, mechanical simplicity, scientific requirements, spatial resolution, simultaneous pictures in different spectral ranges, variable slit size and location, and image stability. Preliminary calculations are given for resolving power and wavelength range for an echelle spectrograph, and for slit size and exposure times. The ATM compatibility-pointing accuracy and stability constraints, and record display system are mentioned. N.E.N.

N70-29617*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

PHOTOHELIOGRAPH OPTICAL TESTING, NOVEMBER 1967 – JUNE 1968

C. J. Chocol 12 Aug. 1968 14 p refs
(Contract NAS7-100)
(NASA-CR-110249; JPL-750-10) Avail: CFSTI CSCL 20F

The techniques and equipment to be used in testing the photoheliograph for the ATM are briefly described. A laser unequal path interferometer was chosen to measure the performance of the optical system. It will be used with a chamber providing vacuum and solar simulation. The interferometer can measure the optical quality of the primary mirror alone or of the entire optical system by autocollimation. The output data of the interferograms can be reduced directly to yield the modulation transfer function and Strehl ratio. N.E.N.

N70-29631# National Aerospace Lab., Amsterdam (Netherlands).

A QUANTITATIVE METHOD TO EVALUATE THE FAIL-SAFETY ASPECTS OF FLIGHT INSTRUMENTATION WIRING PATTERNS

J. M. H. Van Iaenderen *In* AGARD Probl. of the Cockpit Environment Mar. 1970 10 p ref (See N70-29618 15-02)
Avail: CFSTI

An investigation was conducted concerning the fail-safe aspects of instrument system wiring configurations. The investigation covered the electrical instruments only, since it is in this part that the greatest variety and complication in interconnection exists and as it is also the part most vulnerable to failures. Author

N70-29636# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

SOME ASPECTS OF THE DISPLAY CONFIGURATION OF MODERN AIRCRAFT

G. Schweizer and W. Bollinger *In* AGARD Probl. of the Cockpit Environment Mar. 1970 17 p (See N70-29618 15-02)
Avail: CFSTI

The operation of large VTOL aircraft requires new landing instrumentation-aids, new displays for the engine information, and elaborate check-out displays. A head-up display for VFR-conditions as a new landing aid was designed and flight-tested in a G-91 fighter with good results. The design goal is to enable the pilot to touch down accurately at a given point and to maintain the prescribed glide-path. This head-up display is redesigned to allow for variable glide-path angles. A simulator program was developed to design new engine instrumentation for the Do 31, and new monitor-displays for the hydraulic and electric system. The simulator program is discussed with respect to the real requirements found during the flight-test program of the Do 31 now in progress. Author

N70-29639# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.

NUMERICAL DISPLAYS FOR THE PRESENTATION OF DYNAMIC INFORMATION

J. M. Rolfe *In* AGARD Probl. of the Cockpit Environment Mar. 1970 5 p refs (See N70-29618 15-02)
Avail: CFSTI

Consideration is given some of the problems inherent in displaying information not in the more conventional form of the position of a pointer on a dial, but in direct numeric terms. The numerical display offers an advantage to the designer inasmuch as it can present a large range of quantitative values in very little panel space. There is ample evidence also that under relatively static conditions the numerical display can be read more quickly and accurately than other forms of display. This was demonstrated in investigations using numerical displays for such purposes as the display of altitude information, time information, and in the machine tool industry. Author

N70-29641# National Aerospace Lab., Amsterdam (Netherlands).

HEAD-UP DISPLAY SYMBOLOGY

F. E. Douwes Dekker *In* AGARD Probl. of the Cockpit Environment Mar. 1970 7 p (See N70-29618 15-02)
Avail: CFSTI

Flight tests are performed to gain experience in the generation of accurate vectorial information, the use of the flight path vector as primary flight parameter, including some form of quickening and the choice of symbols fixed to the outside world. Author

N70-29645# Royal Aircraft Establishment, Farnborough (England).

THE ELECTRONIC DISPLAY OF PRIMARY FLIGHT DATA

David J. Walters *In* AGARD Probl. of the Cockpit Environment Mar. 1970 11 p refs (See N70-29618 15-02)
Avail: CFSTI

Space can be found for the increased number of displays needed in a modern cockpit either by utilization of new areas, as in the Head-up Display, or by time-sharing between various displays. In either case electronic techniques are eminently suitable but care must be taken, in a display by this means, of primary flight data. Examples are given of ways of showing height, speed, heading, flight vector, and attitude. Author

N70-29646# Rolls-Royce, Ltd., Derby (England).
ENGINE CONTROL AND INSTRUMENTS PRESENTATION
D. Whitham *In* AGARD Probl. of the Cockpit Environment Mar 1970 12 p (See N70-29618 15-02)
Avail: CFSTI

The methods of rating, control, and operation of turbojet and turbofan engines in relation to the role of the aircraft are discussed. Future engine control systems for combat/strike and transport aircraft, development of reliable automatic controls to safeguard engine reliability and thus facilitate a reduction in the pilot's instrumentation are recommended. The accuracy and readability requirements of engine instruments are described, and recommendations made for the types of instruments required and the layout of instruments panels in combat/strike and transport aircraft. Further development of computerized and motorized instrument displays, auto-monitoring and maintenance recorders are proposed to reduce the pilot's workload. It is recommended that emergency controls be designed to simplify the pilot's drills and thus enable him to deal with engine fire and failure more quickly and effectively. Efforts to achieve a greater degree of standardization in emergency controls are also suggested. Author

N70-29647# Compagnie Generale de Telegraphie sans Fil, Paris (France).
A COLLIMATOR FOR HEAD-UP DISPLAY PILOTING (CSF 193) [UN COLLIMATEUR DE PILOTAGE (CSF 193)]
P. Deliac *In* AGARD Probl. of the Cockpit Environment Mar. 1970 11 p In FRENCH and ENGLISH (See N70-29618 15-02)
Avail: CFSTI

A head-up display was designed with a view to forming part of an integrated flight equipment intended to fly the commercial aircraft of the future. The advantages and a description of the CSF head-up display 193 are given. J.M.C.

N70-29648# IIT Research Inst., Chicago, Ill.
DEVELOPMENT OF NEUTRON SPECTROMETRY FOR CRITICAL FACILITIES Quarterly Report, 1 Oct. - 31 Dec. 1969
R. A. Semmler Jan. 1970 5 p
(Contract AT(11-1)-578)
(IITRI-578-P-33-15; QR-5) Avail: CFSTI

Analysis of the proton recoil data obtained at Argonne National Laboratory was continued. Design of new wire supports for the wall-less proportional counter is in progress. Author (NSA)

N70-29654# National Bureau of Standards, Washington, D.C.
STANDARD NUCLEAR INSTRUMENT MODULES
Louis Costrell Dec. 1969 39 p refs
(TID-20893-REV-3) Avail: SOD $0.40

An updated and clarifying revision of the standard Nuclear Instruments Modules specifications to assure mechanical and electrical interchangeability of transistorized modular instruments is presented. NSA

N70-29662# Naval Electronics Lab. Center for Command Control and Communications, San Diego, Calif. Optical Technology Div.
THE USE OF HOLOGRAPHIC SUBTRACTION IN THE OPTICAL PROCESSING OF RECONNAISSANCE DATA Research and Development Report, Jun. 1968 - Mar. 1969
M. A. Monahan, K. Bromley, J. F. Bryant, and B. J. Thompson (Rochester Univ.) 23 Oct. 1969 19 p refs Presented at the 17th AGARD Avionics Panel Tech. Symp., Tonsberg, Norway, 29 Sep. - 3 Oct. 1969
(AD-701327; NELC-1665) Avail: CFSTI CSCL 14/5

A technique is designed to subtract an undesired portion of an image from a given optical scene. A wave reconstructed from a hologram is shifted in phase by pi radians relative to the wave originally stored; thus, if two nearly-identical images of an input plane, one derived from a hologram and the other a direct image, are superimposed upon each other at a viewing screen, the identical portions of the images are canceled, and the difference between the two is displayed. The method has been verified experimentally for both binary and continuous-tone transparencies. Author (TAB)

N70-29665# Miami Univ., Fla. Rosenstiel School of Marine and Atmospheric Sciences.
A RAPID FIELD SAMPLING SYSTEM FOR TRITIUM IN ATMOSPHERIC HYDROGEN Progress Report
H. Gote Ostlund 1 Feb. 1970 6 p
(Contract AT(40-1)-3944)
(TID-25345) Avail: CFSTI

The development of an air sampling system for tritium determination in the atmosphere is described. The sampling system is based on adding tritium-free hydrogen gas as carrier to dried air and catalytically combusted on finely dispersed palladium metal. These water samples are collected for laboratory analysis. The sampler is designed for use in an automobile or in an aircraft with pressurized cabin. NSA

N70-29676# National Standards Lab., Chippendale (Australia).
REFERENCE TABLES FOR THERMOCOUPLES
T. P. Jones 1969 29 p refs
(PB-188481; TP-26) Avail: CFSTI CSCL 14B

The introduction of the International Practical Temperature Scale of 1968 (IPTS 68) has resulted in significant errors in reference tables based on IPTS 48. The tables, presented here, convert existing tables to IPTS 68. Author (USGRDR)

N70-29727# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MODEL Z28-1 VIBRATION PICKUP
4 Aug. 1969 5 p Transl. into ENGLISH from Jen Min Jih Pao (Mainland China), no. 167, 24 Feb. 1968 p 6
(AD-700802; FTD-HT-23-847-68) Avail: CFSTI CSCL 14/2

The model Z28-1 vibration pickup is an accelerometer for use as a vibration pickup component for the Model Z25-2 vibration meter. Technical specifications are: (1) maximum measurable acceleration, 200 g; (2) sensitivity, 80-130 mV/g; (3) frequency response, 18,000-25,000 Hz; (4) weight, 40 g. Author (TAB)

N70-29737# Atomic Power Development Associates, Inc., Detroit, Mich.
EXPERIENCE WITH UNC OXYGEN METERS IN APDA SODIUM TECHNOLOGY LOOP
J. E. Meyers, R. A. Hunter, N. N. Mueller, and C. C. Scott Dec. 1969 31 p refs
(Contract AT(11-1)-865)
(APDA-245) Avail: CFSTI

In the quantitative evaluation of the UNC oxygen meter as a means of monitoring impurities in sodium, 12 of the oxygen meter electrode assemblies have been evaluated in the APDA sodium technology loop since 1965. Calibration constants determined by impurity injections ranged from -19 to -40/volts. Sodium temperature coefficients varied from 0.56 to 0.04 mV/F, and ambient temperature coefficients varied from -1.16 to 0.0 mV/F. Gamma radiation caused response changes from 0 to more than 50 mF, depending on the meter. Although the oxygen meters responded immediately to changes in oxygen concentration, the total response time for oxygen meters operating more than several months was prohibitively long. Author (NSA)

N70-29753# TRW Systems Group, Redondo Beach, Calif. Physical Research Center.
ECOLOGICAL STUDIES OF MARINE PLANKTON Final Report
Vakula S. Srinivasan and Herbert P. Silverman Feb. 1970 36 p

refs
(Contract N00014-67-C-0316)
(AD-702499; TRW-07966-6002-R0-00) Avail: CFSTI CSCL 8/1

Holographic techniques for the ecological study of marine plankton were examined. Holocamera design, laser illumination sources and recording emulsion requirements were investigated. Exploratory work on phototactic responses of marine organisms and holographic movies for the locomotion of copepods were performed. Image reduction techniques for the study of large volumes were investigated. A technique for recording large volume scenes was successfully demonstrated. Author (TAB)

N70-29817# Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia).

SET OF SEVEN THRESHOLD DETECTORS USED AS A FAST NEUTRON SPECTROMETER

M. Najzer, J. Rant, and H. Solinc Oct. 1969 25 p refs
(Contract IAEA-536/RB)
(IJS-R-570) Avail: CFSTI

Seven threshold detectors were selected for measurements of neutron spectra in the energy interval from 1.5 MeV to 14 MeV. Characteristic features concerning the activation in the neutron flux, measurements of induced activities, and determination of specific activity are described for each selected detector. Author

N70-29882*# Scientific Translation Service, Santa Barbara, Calif.

INVESTIGATION OF CERTAIN PHOTOMETRIC CHARACTERISTICS OF AN IONIZATION CALORIMETER MOUNTED ON THE MASSIVE PROTON SATELLITE [ISSLEDOVANIYE NEKOTORYKH SVETOTEKHNICHESKIKH KHARAKTERISTIK IONIZATIONNOGO KALORIMETRA, USTANOVLENNOGO NA TYAZHELOM ISKUSSTVENNOM SPUTNIKE ZEMLI PROTON]

D. M. Kovrizhnykh et al Washington NASA May 1970 14 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 3, Fiz. Astron. (USSR), v. 22, Oct. 1967 p 72 – 79
(Contract NASw-2035)
(NASA-TT-F-12911) Avail: CFSTI CSCL 14B

The procedure used to measure the luminescence yield of plastic scintillators employed as detectors in an ionization calorimeter on board the Proton satellite is described. The design and principles of operation of the interaction and energy detectors are included. Author

N70-29888*# American Science and Engineering, Inc., Cambridge, Mass.

HIGH RESOLUTION X-RAY IMAGES OF THE SUN USING A GRAZING INCIDENCE TELESCOPE FROM A SOLAR POINTING AEROBEE ROCKET Final Report, Apr. 1968 – Mar. 1970

J. Davis, A. De Caprio, R. Haggerty, A. Krieger, H. Manko, et al 30 May 1970 75 p refs
(Contract NASw-1700)
(NASA-CR-110354; ASE-2438) Avail: CFSTI CSCL 14E

Flight film obtained from an Aerobee 150 rocket on March 15, 1968 was analyzed and a high resolution grazing incidence X-ray telescope system flown on June 8, 1968 was calibrated, tested, and aligned. The X-ray flux for the whole sun was determined and X-ray flares in the active region were recorded. The central core of the X-ray region is correlated to the H alpha image of the sun. R.B.

N70-29905# Argonne National Lab., Ill.

THE EDDY-CURRENT FLOWMETER: AN ANALYSIS GIVING PERFORMANCE CHARACTERISTICS AND PREFERRED OPERATING CONDITIONS

David E. Wiegand Aug. 1969 64 p refs
(Contract W-31-109-eng-38)
(ANL-7554) Avail: CFSTI

In the eddy current flowmeter, motion of a fluid is measured through inductive coupling to exciting and sensing windings. An optimum excitation frequency, depending on the channel size and the fluid properties, yields maximum sensitivity. Operation in the region of the optimum frequency minimizes temperature errors and reduces velocity profile effects. Author (NSA)

N70-29906# George Washington Univ., Alexandria, Va. Human Resources Research Office.

A PICTORIAL PROGRAM FOR THE STARLIGHT SCOPE

Richard J. D. Frank, William N. Gipe, and William L. Warnick May 1969 19 p
(Contract DAHC19-69-C-0018)
(AD-701909) Avail: CFSTI CSCL 19/5

The document presents a pictorial program of instruction for the operational tasks required for the Starlight Scope. Author (TAB)

N70-29939# IIT Research Inst., Chicago, Ill.

STUDIES TO DETERMINE THE FEASIBILITY OF MEASURING AIRBORNE DEBRIS IN DUST AND HOT GAS ENVIRONMENTS USING AN INFRARED SCANNING CAMERA Final Report, 1 Mar. – 31 Aug. 1969

Paul Lieberman and Elliott Raisen 12 Sep. 1969 103 p
(Contract DASA01-69-C-0097)
(AD-702523; IITRI-J6172-FR; DASA-2400) Avail: CFSTI CSCL 18/3

The report describes the theory for the absorption and scattering of electromagnetic energy by a dielectric particle, gas molecules, non-disperse clouds of the same particle material size, clouds having specified distribution of particle sizes, and clouds of particles in air. The analysis is specialized to consider the transmission of images through the fine particles and hot gases generated by the detonation products of a TNT explosion, as detected by visible light and infrared wavelength photography. The theory is further expanded to include discussion of the detection of objects in the explosion products by the emission and reflection of infrared energy from the object. A BOFORS Model T-101 infrared scanning camera with a frame speed of four frames per second was used to obtain infrared pictures of targets in the 1.0- to 5.5-micron wavelength region in laboratory tests, cloud chamber tests, and in 2-pound TNT explosives tests. Target pictures were enhanced by the use of infrared flare illumination, a magnifying mirror, and filtration of unwanted background. Author (TAB)

N70-29970# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisca.

DOSIMETRY OF THE GAMMA RADIATION FROM A CO 60 SOURCE BY MEANS OF THE FRICKE FERROUS SULFATE METHOD [DOSIMETRIA DELLA RADIAZIONE GAMMA DI UNA SORGENTE DI CO 60 COL METODO CHIMICO DI FRICKE AL SOLFATO FERROSO]

A. Araco, A. Grisanti, and P. Tori 25 Jul. 1969 17 p refs In ITALIAN; ENGLISH summary
(ISS-69/31) Avail: CFSTI

The ferrous sulfate chemical dosimeter has been used to determine the absorbed radiation dosage for a high intensity Gamma Beam 650 CO60 source. Author

N70-29971*# Philips Labs., Briarcliff Manor, New York.

X-RAY EQUIPMENT FOR LUNAR RECEIVING LABORATORY, VOLUME 1 Final Report, Sep. 1968 – Apr. 1969

N. Spielberg and G. Ziedins Apr. 1970 90 p refs
(Contract NAS9-8813)
(NASA-CR-108466) Avail: CFSTI CSCL 14B

A detailed description is presented of the design, fabrication, installation, and operation of an X-ray diffractometer and X-ray spectrograph system for preliminary examination of returned samples of lunar soil while these are still in quarantine within the Lunar Receiving Laboratory. The instrument heads are within the primary biological barrier at LRL and are operable by remote control from within the secondary biological barrier. The remote control may be accomplished by either a manual or computer control system. Emphasis is on the instruments and the manual control system. Author

N70-29972*# Philips Labs., Briarcliff Manor, New York.

X-RAY EQUIPMENT FOR LUNAR RECEIVING LABORATORY, VOLUME 2, PART 1 Final Report

N. Spielberg and G. Ziedins Apr. 1970 89 p
(Contract NAS9-8813)
(NASA-CR-108467) Avail: CFSTI CSCL 14B

Each instrument, the diffractometer and the spectrograph, employs an individual control system. Because of the similarity of both systems, a typical system applicable to either is described. Where special provisions are pertinent to one of the instruments, the exception is noted. Connector pin assignments for all connectors are given. Author

N70-29974# Addis Translations International, Woodside, Calif.

A CLASSIFICATION OF METHODS FOR MEASURING FLATNESS [EINE KLASSIFIZIERUNG DER EBENHEITS MESSEMETHODEN]

J. Kilpi Nov. 1969 21 p refs Transl. into ENGLISH from Ann. of CIRP, v. 17, 1969 p 74/1–74/6 Transl. for Calif. Univ., Berkeley. Lawrence Radiation Lab.
(PB-188140T; VCRL-Trans-10406) Avail: CFSTI CSCL 14B

Depending on the nature of the measuring method, the measuring pattern has to satisfy certain minimum requirements in order that the flatness might be determined. Thus three groups are obtained. The methods based on the measurement of straightness required at least three divergent measuring series, which meet in the vertices of a triangle lying in the area to be measured. If the measuring apparatus determines the inclination with regard to a certain datum plane, two intersecting series will be enough. The measurement of the height coordinates does not require any special measuring pattern since each point can be determined independently of the others. The methods of measuring straightness and inclination require mathematical adjustment operations, which influence essentially the reliability of the end result. Author (USGRDR)

N70-29977*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CRYOGENIC TEMPERATURE MEASUREMENT

Donald H. Sinclair, Howard G. Terbeek, and Jerry H. Malone [1970] 40 p refs Presented at Cryog. Eng. Conf., Boulder, Colo., 17–19 Jun. 1970; sponsored by Cryog. Soc. of Am.
(NASA-TM-X-52825) Avail: CFSTI CSCL 14B

The state-of-the-art of cryogenic temperature measurement is discussed. The characteristics of metallic and semiconductor resistance thermometers, thermocouples, and other types of thermometers are discussed. Comments on calibration, installation, and associated measuring circuitry are given for the more common types of thermometers. Also, recent changes in temperature scales are presented. Author

N70-29997# Dow Chemical Co., Golden, Colo. Rocky Flats Div.

INSTALLATION OF A FLAME SPECTROMETER FOR THE ANALYSIS OF RADIOACTIVE SOLUTIONS

Andrew J. Johnson and Glen A. Shepherd 9 Mar. 1970 3 p refs
(Contract AT(29-1)-1106)
(RFP-1344) Avail: CFSTI

A Jarrell-Ash Model 82-360 Atomic Absorption Flame Spectrometer was installed in a specially designed glove box for use in the analysis of radioactive materials. The design and installation of the glove box, the ventilation and safety precautions, and the analytical operation of the instrument are discussed. Examples are given of the types of analyses performed. Author (NSA)

N70-30001*# National Aeronautics and Space Administration. Electronics Research Center, Cambridge, Mass.

GUIDANCE AND CONTROL PAYLOAD SUPPORT REQUIREMENTS FOR A PLANETARY CARTOGRAPHIC PROBE

Saul Moskowitz Washington Jun. 1970 45 p refs
(NASA-TN-D-5853; C-109) Avail: CFSTI CSCL 14B

The guidance and control requirements for payload support of a planetary orbiting cartographic spacecraft were examined. Mapping scales of 1:1,000,000 and 1:5,000,000 were selected for the parametric study of Lunar, Martian, and Jovian cartography. Relations were established between camera pointing angle, field-of-view, and imaging resolution in terms of planetary physical characteristics and mapping scale. From these, orbit selection rules were formulated for orbits of various inclinations with particular attention directed towards those of 30 and 90 degrees (polar orbits). Spacecraft attitude control requirements were then obtained as a function of these parameters and the selected image overlap. The resulting overall guidance and control specifications are described in terms of potential instrumentation subsystems. Author

N70-30066# Argonne National Lab., Ill. Metallurgy Div.

AUTOGRAPHIC DILATOMETER FOR USE WITH PYROPHORIC AND ALPHA-ACTIVE MATERIALS

F. L. Yaggee and J. W. Styles Dec. 1969 19 p refs
(Contract W-31-109-eng-38)
(ANL-7643) Avail: CFSTI

A fused quartz dilatometer was designed and constructed specifically for obtaining dilatation and phase transformation data for plutonium bearing alloys that are potential nuclear fuels. The dilatometer operates over the range from 25 to 1000 C, provides for programmed heating and cooling rates from 1/2 to 200 C min, and will accommodate cylindrical, tubular, or sheet specimens that are from 1/4 to 2/5 in. in diameter (or width) and 1/4 to 2 in. in length. Among the unique features incorporated in the apparatus design are (1) a mechanical means of verifying the electronic output representing specimen expansion, and (2) two matched electronic gaging heads for monitoring expansion displacement. The gaging heads may be used separately to monitor free expansion as a function of specimen temperature, or simultaneously to determine the expansion interaction between two dissimilar materials that are in intimate contact even when the materials exhibit widely different physical, mechanical, and thermal properties. Author (NSA)

N70-30162# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorwerkstoffe.

AN OPTICAL METHOD TO DETERMINE THE LOCAL ANISOTROPY IN PYROLYTIC CARBON AND GRAPHITE [EINE OPTISCHE METHODE ZUR BESTIMMUNG DER LOKALEN ANISOTROPIE AN PYROLYTISCHEN KOHLENSTOFFSCHICHTEN UND GRAPHIT]

H. B. Gruebmeier and G. P. Scheidler May 1969 25 p refs In GERMAN; ENGLISH summary
(JUL-597-RW) Avail: CFSTI

The anisotropic structure of pyrolytic carbon on coated particles for nuclear fuel elements is determined by an optical method which measures the intensity of reflected polarized light in two perpendicular directions with a microscope photometer. The degree of orientation is described by an optical anisotropy factor, which is related experimentally to the BACON anisotropy factor.

A theoretical relation was found between the optical anisotropy factor, the orientation parameter of BOKROS, and the BACON anisotropy factor, which fits the experimental values. Author

N70-30220# International Research and Development Co., Ltd., Newcastle (England).

SURVEY OF DIELECTRIC BOLOMETERS FOR SPACE APPLICATIONS

R. J. Mytton Paris ESRO Oct. 1969 77 p refs
(Contract ESTEC-67g/63AA)
(ESRO-CR-10) Avail: CFSTI

The development of dielectric bolometers is reviewed, and the ferroelectric barium strontium titanate bolometer and the thin film dielectric bolometer are analyzed. Their responsivity is calculated, and the thermal impedance of suitable support are evaluated. The various sources of noise are identified, and the total noise calculated. Ferroelectric dielectric detectors for specific spacecraft applications are briefly discussed. Author (ESRO)

N70-30305# Atomic Energy Commission, New York. Health and Safety Lab.

TECHNIQUE FOR DETERMINING MODERATED-NEUTRON INSTRUMENT CHARACTERISTICS

Ferenc Hajnal, James E. Mc Laughlin, and Ronald Oechsler Feb. 1970 25 p refs
(HASL-222) Avail: CFSTI

Reproducible measurements with moderated-neutron detectors were made for polyethylene spheres and a DePangher precision long counter (PLC). Data analyses were performed using both DePangher's technique for a PLC where the scattered neutrons are constant and Lindenbaum's model for accelerator skyshine where the scatter is distance and medium dependent. The agreement of the detector characteristic and sensitivity values from the two analyses was very good for the PLC and adequate for the moderating spheres. Agreement with published sensitivity values was also good. Taking account of spectral dependence, the PLC results from the Pu-Be measurements reproduced the Cf-252 neutron yield well within experimental errors. The moderating sphere results agreed with the Cf-252 source yield only to within about 10%. To apply this work to neutron energies below about 1 MeV, the response of the PLC should be evaluated as the ICRU has recommended. The small sphere responses should be reevaluated for a point-source geometry and fairly narrow energy bins to reduce the observed discrepancy. Author (NSA)

N70-30312# California Univ., Livermore. Lawrence Radiation Lab.

REAL-TIME COMPUTER PREDICTION OF END POINTS IN CONTROLLED-POTENTIAL COULOMETRY

F. B. Stevens, Fredi Jacob, L. P. Rigdon, and J. E. Harrar 5 Feb. 1970 52 p refs Presented at the Conf. on Anal. Chem. and Appl. Spectry, Cleveland, Ohio, 6 Mar. 1970 Submitted for publication
(UCRL-72009; Conf-700303-1) Avail: CFSTI

Two real-time computer techniques have been developed for predicting the final value of the charge in a controlled-potential coulometric determination. One method, for which a suitable instrument has been designed, is an analog-type computation. The other technique employs an on-line digital computer programmed to perform the calculation. A procedure has been developed for handling background current corrections for predictive coulometry so that the technique can be used as an absolute method. Both analog and digital systems yield analytical results with an accuracy and precision of 0.1 to 0.2%, in one-third the electrolysis time required for conventional controlled-potential coulometry. The systems also incorporate a readout of the electrolytic rate constant. This feature is useful for testing an electrochemical system for conformance to the simple exponential rate law, which is necessary for accurate prediction, and for detecting kinetic complications in the electrochemical reaction. Examples are given using Pb, V, and U. Author (NSA)

N70-30324# Sandia Corp., Albuquerque, N.Mex.

HIGH VOLTAGE PULSE MEASURING SYSTEM

D. C. Wunsch (Braddock, Dunn and McDonald, Inc.) and S. R. Booker [13 Mar. 1970] 18 p refs Sponsored by AEC Prepared in cooperation with Braddock, Dunn and McDonald, Inc.
(SC-DC-70-4747; Conf-700302-2) Avail: CFSTI

A system to measure high voltage pulses with very high resolution is described. The system is based on a unique application of the electro-optic Kerr effect and measures voltage pulses. The system has a linear frequency response to approximately 100 MHz. Unlike the resolution of other voltage-measuring systems, the resolution of this system increases as the voltage pulse increases toward its peak value. The peak pulse magnitude can be measured with a resolution of better than 0.1%. The system can be calibrated so that the measured value of the peak voltage is accurate to within + or − 1% of the true value. This high resolution is obtained by modulation of a constant intensity light source by action of a Kerr cell. The electric field intensity resulting from the high voltage pulse causes phase differences as great as 25 omicron radians between light components in the Kerr cell. Consequently, many light cycles are obtained during the voltage rise of the pulse. This produces extreme resolution near the peak of the pulse. Near the peak, a 2% change in voltage results in a 100% change in light intensity. Author (NSA)

N70-30327# Miami Univ., Fla. Rosenstiel School of Marine and Atmospheric Sciences.

RADAR SEA STATE ANALYZER Final Report, 15 May 1968 15 Aug. 1969

George F. Andrews and Homer W. Hiser Dec. 1969 40 p refs
(Contract N00019-68-C-0393)
(AD-702469; B8765-1; ML-70012) Avail: CFSTI CSCL 4/2

The theory and description of a Radar Sea State Analyzer are presented. Installation, operation, adjustments, and readout interpretation instructions are also included. The instrument is the product of three years of research to obtain sea state information by using an existing radar as the remote sensor. This device is an attachment to the radar and examines the sea return signals at a selected range within the limits of the radar horizon. The outputs are available in digital and analog form. It is small in size and uses modern semi-conductor techniques, integrated circuits, etc. to achieve stability, accuracy and reliability. Author (TAB)

N70-30338# Iowa State Univ. of Science and Technology, Ames.

AMES LABORATORY ON-LINE CONTROL SYSTEM FOR BUBBLE CHAMBER FILM MEASURING

W. J. Higby and A. H. Klein Dec. 1969 33 p refs
(Contract W-7405-eng-82)
(IS-2228) Avail: CFSTI

A bubble chamber film measuring control system is described. The main features of the system provide for complete flexibility of control criteria used for a given experiment. The syntax of the KERTRAN language is given with examples of how it is used for control purposes. Author (NSA)

N70-30406# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerper- und Neutronenphysik.

PROBLEMS OF HEAT TRANSFER IN SOLID STATE BODY CALORIMETRY [PROBLEME DES WAERMEUEBERGANGES IN DER FESTKOERPERKALORIMETRIE]

H. J. Wollenberger (Ph.D. Thesis—Tech Hochsch. Aachen) Nov. 1969 59 p refs In GERMAN
(JUL-621-FN) Avail: CFSTI

In solid state calorimetry the absolute measuring accuracy

is less than in other disciplines. The causes were investigated and it is shown that systematic errors can only arise from an undetected heat transfer between certain parts of the apparatus. The causes of these heat leakages in several calorimeters are discussed.
ESRO

N70-30489# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
KT-90 TELEVISION CAMERA FOR TRANSMITTING MOVIE FILMS
R. S. Kharchikyan 30 Jan. 1970 11 p Transl. into ENGLISH from Tekhn. Kina i Televideniya (Moscow), v. 12, no. 5, 1968 p 9 16
(AD-702994; FTD-HT-23-350-69) Avail: CFSTI CSCL 17/2.1

The KT-90 television camera used for transmitting movie films uses a specially developed 38 mm vidicon which possesses high resolution, good signal uniformity across the field, slight geometric distortions and a large signal output. This gives image quality which significantly exceeds in all technical characteristics that provided by previously developed cameras. The article gives technical data for the 38 mm LI-418 vidicon and describes the units and assemblies which make up the camera, i.e. pickup tube, magnetic system, preamplifier, quenching pulse unit, automatic control unit, horizontal and vertical sweep generator, high voltage rectifier, voltage regulator unit, filament supply transformer and the pickup tube work-hour counter. The camera body is made of cast aluminum alloy with hinged covers allowing access to all the assemblies. The camera is mounted stationary in the television movie projection room and is joined to an optical commutator which allows projection of an image to the camera from any of the projectors located in the room. All optical and mirror elements necessary for this are mounted in the commutator. Work of the camera, camera channel and the power pack is provided for by a 100 meter long camera cable connecting the camera to the control room.
TAB

N70-30490# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE SECON: A NEW CLASS OF TV CAMERA TUBE
N. Ya. Venediktov et al 28 Jan. 1970 13 p refs Transl. into ENGLISH from Tekhn. Kina i Televideniya (Moscow), v. 12, no. 7, 1968 p 72 78
(AD-702992; FTD-HT-23-346-69) Avail: CFSTI CSCL 17/2

A new type of TV camera, the SECON, was developed, which combines features of both the image orthicon and the vidicon in its operation. In the secon (abbreviation for SEC-vidicon; SEC stands for secondary-electron conductivity) the photoelectrons of the secondary-electron conductivity of the target is used. The target stores and preamplifies the charge image before it is commuted by the reading beam. This camera is the result of studying the properties of certain dielectrics. The signal is taken off the load resistor of the signal plate. Secons use both magnetic and electrostatic deflection and focusing, and quite often there are mixed types, i.e., a camera with electrostatic focusing and magnetic deflection. Certain secons can out-perform both image orthicons and vidicons, but because of their low specific sensitivity they cannot completely replace high-sensitivity image orthicons, and because of their large size and working voltages they cannot completely replace vidicons. Many examples of secons which work in the visible, ultraviolet and other spectral regions are given.
Author (TAB)

N70-30507*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
AN ANALYSIS OF CARBON 14 RADIATION DETECTION SYSTEMS Final Report
K. Wainio Oct. 1969 92 p
(Contract NAS2-5546)
(NASA-CR-73455; BSR-2781) Avail: CFSTI CSCL 14B

Carbon-14 detection techniques for possible use in three categories of life detection experiments in unmanned missions to Mars are evaluated. The two principal detection techniques are: a pair of small detectors mounted face-to-face and a thin wall plastic scintillator. Results of detector evaluations are discussed as well as the background radiation intensities used in the calculations, the procedures used in calculating signal and background count rates for the paired detectors, and a figure of merit for comparing detector effectiveness. It is recommended that diffused junction and plastic scintillation detectors be used in the breadboard phase of the program.
E.C.

N70-30532*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DISCRETE CONTROL OF LINEAR DISTRIBUTED SYSTEMS WITH APPLICATION TO THE DEFORMABLE PRIMARY MIRROR OF A LARGE ORBITING TELESCOPE
Jeremiah F. Creedon (Ph.D. Thesis—Rhode Island Univ.) 1970 111 p refs
(NASA-TM-X-62960) Avail: CFSTI CSCL 17 H

The results of a detailed study of the discrete control of linear distributed systems is presented with specific application to the design of a practical controller for a plant representative of a telescope primary mirror for an orbiting astronomical observatory. The problem of controlling the distributed plant is treated by employing modal techniques to represent variations in the optical figure. Distortion of the mirror surface, which arises primarily from thermal gradients, is countered by actuators working against a backing structure to apply a corrective force distribution to the controlled surface. Each displacement actuator is in series with a spring attached to the mirror by means of a pad intentionally introduced to restrict the excitation of high-order modes. Control is then exerted over a finite number (equal to the number of actuators) of the most significant modes. Through the application of the modal expansion technique the mirror equation of motion is transformed to a set of uncoupled, linear, time-invariant, ordinary differential equations.
Author

N70-30533# Block Engineering, Inc., Cambridge, Mass.
FURTHER INVESTIGATIONS OF ROCKET LAUNCH-PHASE INSPECTION TECHNIQUES INSTRUMENTATION, VOLUME 3
Merle J. Persky Jan. 1969 60 p refs
(Contract ACDA/ST-132)
(AD-701256; ST-132/R-37-Vol-3) Avail: CFSTI CSCL 17/8

The instrumentation used to obtain data for the purposes of an investigation into the use of passive, optical techniques for arms control inspection of rocket testing is described. Three distinct systems were used. The first employed a single detector infrared spectrometer; the second was a prototype multiple detector spectroscopic system and the third was an improved, operational version of the multiple detector system. Common to all three were documentary and engineering sequential cameras. Included in the report is a detailed discussion of the three systems as well as an explanation of the spectral data processing procedures.
Author (TAB)

N70-30537# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
LECTURES ON ELECTRON MICROSCOPY, NO. 6 [APPUNTI DI MICROSCOPIA ELETTRONICA, 6]
D. Steve Bocciarelli 15 May 1969 58 p refs In ITALIAN
(ISS-69/24) Avail: CFSTI

This report deals with two particular types of observations that can be performed by an electron microscope: moire patterns, stereomicroscopy. The methods to execute linear, surface, volume and weight measurements and particle counting are presented. Moreover the autoradiographic technique and its use in electron microscopy is described.
Author

N70-30548# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
LECTURES ON ELECTRON MICROSCOPY, NO. 5 [APPUNTI DI MICROSCOPIA ELETTRONICA, 5]
D. Steve Bocciarelli 15 May 1969 50 p refs In ITALIAN
(ISS-69/23) Avail: CFSTI

In this report, after explaining the formation of the diffraction pattern, the technical characteristics of an electron diffraction camera are given. The advantages of using an electron microscope as a diffraction camera are considered. Author

N70-30553# Fraunhofer-Gesellschaft zur Forderung der Angewandten Forschung e. V., Grafschaft (West Germany). Inst. fuer Aerobiologie.
SCATTERED LIGHT MEASUREMENT METHODS FOR AEROSOLS [STREULICHT-MESSVERFAHREN FUER AEROSOLE]
F. J. Moenig *In its* Examples of Appl. Res. Jun. 1969 p 15–20 In GERMAN Sponsored by Min. fuer Wirtsch., Mittelstand und Verkehr, Nordrhein-Westfalen (See N70-30551 15-34)
Avail: CFSTI

Speed is a great advantage of the scattered light method for measuring particle size distributions and aerosol densities compared with other methods, for within a few seconds the magnitude can be measured, without using a complicated evaluation method. A description is given of a scatterometer and the problems encountered. ESRO

N70-30558# Fraunhofer Institut, Freiburg (West Germany). Ernst-Mach Inst.
HIGH-SPEED PHOTOGRAPHIC METHODS FOR INVESTIGATION OF SPHERICAL DETONATION WAVES IN GAS MIXTURES [KURZZEITFOTOGRAFISCHE METHODEN ZUR UNTERSUCHUNG KUGELFOERMIGER DETONATIONSWELLEN IN GASGEMISCHEN]
W. Struck *In* Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 47–52 refs In GERMAN (See N70-30551 15-34)
Avail: CFSTI

The investigation of fast processes such as the propagation of spherical detonation waves in gas mixtures requires the use of short-time methods, having time resolutions of less than 1 microsecond. Streak or Schmier photography can be used with a revolving drum camera. For visualising density variations an optical interference method which can record differential interferograms can be employed. Finally Schlieren photography employing a rotating-mirror framing camera is also described. ESRO

N70-30593*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A SMALL DIFFERENTIABLE LIQUID SCINTILLATOR NEUTRON SPECTROMETER
Donald Shook [1970] 11 p refs
(NASA-TM-X-52828) Avail: CFSTI CSCL 14B

A liquid scintillator neutron spectrometer utilizing pulse shape discrimination and a two parameter analyzer is described. The problems of determining a neutron spectrum from a measured proton recoil distribution are discussed. By using a small liquid scintillator about 1/2 inch in diameter by 1/2 inch long, a good measurement of neutron spectra is obtained using the derivative of the proton recoil distribution. Measurements made with the 1/2 by 1/2 NE 218 scintillator for a 5Ci PuBe source show general agreement with better resolution when compared with results for a 2 inch by 2 inch NE 213 scintillator utilizing the ORNL response matrix unfolding technique. Measurements of the resolution of the 1/2 by 1/2 NE 218 scintillator give a value of 9% at 2.8 MeV and 5% at 14.7 MeV. These monoenergetic measurements for NE 218 show agreement with the light table for NE 213 measured at ORNL. A comparison is made between the measured and calculated leakage spectrum from a uranyl fluoride-water solution reactor. The 1/2 by 1/2 NE 218 measurements show general agreement with the calculation. The resolution of NE 218 is sufficiently good to indicate the effects of scattering resonances in oxygen; valleys at 0.5 MeV and 1 MeV are present in both the measured and calculated spectra. Author

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control, and reliability; drafting; and materials fabrication, handling, and inspection.

N70-29278# Mechanical Technology, Inc., Latham, N.Y.
LIQUID METAL BEARINGS TECHNOLOGY FOR LARGE, HIGH TEMPERATURE SODIUM ROTATING MACHINERY Progress Report, 1 Feb. – 31 Oct. 1969
E. B. Arwas, L. Hoogenboom, C. Kissinger, R. Newell, T. Smalley et al Dec. 1969 57 p
(Contract AT(30-1)-3930)
(NYO-3930-6; MTI-70-TR-7) Avail: CFSTI

The analysis was programmed for plain and grooved bearings and a design data handbook was prepared covering partial arc bearings, axial grooved bearings, shrouded step bearings and tilting pad bearings. Effort was devoted to finalization of the proximity transducer assembly detail design, evaluation of prototype transducer with a conducting medium in the probe-target gap, development of the electronic system, evaluation of core and target materials, and evaluation of the transducer-electronic system in a high temperature sodium environment. The design of a film pressure transducer was finalized and evaluated at temperatures up to 1200 F. Eight complete transducers were fabricated for use in the bearing tests. The pressure transducer uses the standard Wayne–Kerr electronic amplification system. The design of the test system was made, including conduct of the rotor-bearing dynamics, stress, and thermal analyses. NSA

N70-29349# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AUTOMATION OF THE PROCESSES OF WELDING AND PRESSURE TREATMENT (SELECTED ARTICLES)
Sep. 1968 212 p refs Transl. into ENGLISH from the Russian
(AD-685505; FTD-MT-24-400-68) Avail: CFSTI CSCL 13/8

Contents: Problems of welders in the field of automation; Development of complex automation of assembly-welding processes in machine construction; Automated welding in carbon dioxide; Automated equipment for butt welding; Programmed control of shifts in welding equipment; Methods of program control of argon arc welding of nonturning pipe joints; Automation of electric arc welding of curvilinear joints; New principles in construction of phototracing systems and prospects for their application in industry; Highly-mechanized production line for welding I-beams and specialized sections for production of welded structures; Mechanization and automation of welding processes at the Gorkiy Automobile Plant; Automation and mechanization of welding of railroad tank cars; Organization of mechanized and automated welding lines; Creation of a complex of automatic and semiautomatic resistance welding machines and mechanized production lines for welding large sheet structures; Automatic welding of silver contacts; Prospects for automation gas-flame oxygen cutting; and Mechanization of the process of production of gluewelded connections. TAB

N70-29371 National Lending Library for Science and Technology, Boston Spa (England).
THE DEVELOPMENT OF LIQUID SODIUM TECHNOLOGY:

REPAIR OF SODIUM PIPING AND INSTRUMENTS
Kazuo Furukawa et al 31 Mar. 1970 3 p Transl. into ENGLISH from Japanese report
(NLL-RISLEY-Trans-1885(B)-(9091.9)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

The repair of sodium loop piping, characteristic problems of sodium and its actual operation, and the repair of the electromagnetic pump are discussed. Safety precautions are given for the handling of sodium. R.B.

N70-29386*# Electro-Optical Systems, Inc., Pasadena, Calif. Electrochemical Section.
THE DEVELOPMENT OF TECHNOLOGY FOR THE ELECTRODEPOSITION OF ALUMINUM ALLOYS AND BERYLLIUM Final Report
Raymond L. Costa [1969] 32 p ref
(Contract NAS1-8953)
(NASA-CR-66941; Rept-4031) Avail: CFSTI CSCL 13H

Program objectives were: to develop a beryllium plating solutions and electrodeposit samples for further studies; to analyze methods of electrodepositing aluminum alloys; and to study long-term aluminum electrodepositing bath stability, that is, a maintainable bath. The results are presented and include the following: (1) A beryllium plating solution was attained which gave very poor electrodeposits. (2) Aluminum alloys were electrodeposited with very low percentages of Ti, Zn and Mn, all of which were inferior to the 100 percent Al. (3) Bath stability tests showed that pyridine and LiAlH4 content must be controlled within specific limits. Author

N70-29605# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON THE PROBLEM OF QUARTZ CERAMIC MOLDING BY THE SLIP CASTING METHOD
P. P. Budnikov 4 Sep. 1969 9 p refs Transl. into ENGLISH from Dopovidi Akad. Nauk Uk. RSR, Ser. Fiz.-Tekhn. Matematichni Nauki (Kiev), v. 29, no. 8, 1967 p 732-735
(AD-700315; FTD-HT-23-1210-68) Avail: CFSTI CSCL 13/8

An investigation was made of the process of slip casting ceramic made with melted quartz. The dependence of basic slip properties on the fineness of grinding, the dependence of pH values on viscosity, and the effect of dross moisture on the properties of slip and castings are shown. The mechanism of changes in the mechanical strength and density of castings is explained. A method of slip aging is proposed making it possible to improve considerably the quality of casting and molding. Moldings with a porosity of 13-15 percent and a transverse bending strength of 10-14 kg/(sq-cm) were obtained using this method. It was established that heating of the dross up to 60C decreases the viscosity and increases the density of the castings. TAB

N70-29696# Battelle Memorial Inst., Columbus, Ohio. Defense Metals Information Center.
AN ENGINEERS GUIDE TO FRICTION
W. A. Glaeser Feb. 1970 16 p refs
(Contract F33615-69-C-1343)
(AD-702441; DMIC-MEMO-246) Avail: CFSTI CSCL 14/2

The need for coefficient of friction information often arises in the solution of a problem by an engineer who may not be concerned with friction on a day-to-day basis, and therefore not current on the derivation and use of such information. The memorandum reviews the theory of friction, discusses the various factors that influence it, and points out some of the common misconceptions in the use of coefficients of friction. A section is specifically devoted to friction in metalworking operations, and another covers rolling friction specifically. Author (TAB)

N70-29715# Oak Ridge National Lab., Tenn.
A VACUUM DEPOSITION TECHNIQUE FOR THIN FILMS OF PO 210 ON ALUMINUM AND TITANIUM
F. R. O'Donnell and H. L. Adair Mar. 1970 11 p refs
(Contract W-7405-eng-26)
(ORNL-4510) Avail: CFSTI

A vacuum evaporation-condensation technique for coating aluminum and titanium substrates with thin uniform films of Po210 is described. The resultant coatings were reproducible and were adherent to the substrates. Some of the Po210 was ejected from the surfaces as a result of nuclear recoil-induced sputtering. The coating techniques and apparatus required to obtain these films on disks and right circular cones are described. Author (NSA)

N70-29763# Sandia Corp., Albuquerque, N.Mex. Technical Translation Service.
CONCERNING A NEW, COMPLETELY NON-CRUCIBLE MELTING PROCEDURE (STIPPLING METHOD) [UEBER EIN NEUES, VOELLIG TIEGELFREIES SCHMELZVERFAHREN (STIPP-VERFAHREN)]
Julius J. Nickl 28 Feb. 1970 7 p refs Transl. into ENGLISH from Z. Metallk. (Stuttgart), v. 60, 1969 p 800-802
(SC-T-70-4006) Avail: CFSTI

A stippling method is described for use in melting granular and sponge-like raw materials without resorting to crucibles. The method can be used to produce polycrystalline or monocrystalline rods, which can be purified further according to well-known zone melting procedures, without using crucibles. Moreover, the stippling method makes it possible to manufacture tubes of high density. The advantage compared with suspension melting is the direct preparation of shaped objects from formless initial materials. Author (NSA)

N70-29771# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NONFERROUS METALS: SELECTED ARTICLES
Ya. M. Okhrimenko et al 6 Aug. 1968 20 p refs Transl. into ENGLISH from Tsvetn. Metal. (USSR), v. 40, no. 5, 1967 p 76-81
(AD-685139; FTD-HT-23-279-68) Avail: CFSTI CSCL 11/6

Contents: Extrusion of metal by means of a device having independent container movement; and Coolable dies for the extrusion of metals. TAB

N70-29863*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXTERNALLY PRESSURIZED GAS-LUBRICATED JOURNAL BEARINGS WITH HERRINGBONE GROOVES: LOAD CAPACITY AND STABILITY ANALYSIS
David P. Fleming [1970] 35 p refs
(NASA-TM-X-52816) Avail: CFSTI CSCL 13I

A small eccentricity analysis was performed to predict load capacity and stability. Numerical results were obtained for a range of feeding parameter, pressure ratio, groove length and orifice recess volume for compressibility numbers from 0 to 50. These results were obtained from a digital computer program. Results showed that the addition of herringbone grooving to an externally pressurized bearing increases stability, but reduces load capacity at low compressibility numbers. A fully-grooved bearing is more stable than a partially-grooved bearing. Orifice recesses reduce stability, especially at high compressibility numbers. Author

N70-29892# California Univ., Livermore. Lawrence Radiation Lab.
A FUNDAMENTAL STUDY OF THE PRESSURE WELDING OF DISSIMILAR METALS THROUGH OXIDE LAYERS
Wesley D. Ludemann (Ph.D. Thesis) Oct. 1969 311 p refs
(UCRL-50744) Avail: CFSTI

Pressure welding is a solid state welding technique where the weld is made by applying heat and pressure to the metals being joined. The pressure is high enough to mate the weld surfaces, but the metals are constrained so that no general deformation occurs. Elevated temperatures improve welding by increasing the ductility of the metals and by allowing dispersion of interfacial contamination by diffusion or reaction. Metal combinations welded in this investigation include iron-copper, iron-aluminum, beryllium-aluminum, and beryllium-copper. Welds were made with sanded surfaces and with oxidized surfaces. Aluminum, copper, and iron were oxidized by heating the metals in air until about 800 A of oxide was formed. Beryllium was dipped in a passivating bath to produce a protective layer about 100 A thick. The thin oxide films residual on sanded surfaces were usually dissipated during welding, and, where metals did not react to form brittle phases, welds were made which exceeded the strength of the weaker metal of the pair. Author (NSA)

N70-29907# Avco Lycoming Div., Stratford, Conn.

FEASIBILITY STUDY OF COLUMBIUM ALLOY CASTINGS Quarterly Progress Report, 1 Aug. – 31 Oct. 1969

Gary F. Lane Jan. 1970 35 p refs
(Contract DAAG46-69-C-0163)
(AD-701929; Rept-2195.8.5; AMMRC-CR-70-5/1) Avail: CFSTI CSCL 13/8

Consumable electrodes of the alloys were arc melted into a water-cooled copper crucible (skull casting) to produce a molten pool of the metal. The liquid metal was subsequently poured into tungsten interfaced shell molds. These molds were produced by the REMET process in which initial tungsten slurry dips provide the non-reactive refractory surface. Thirty-four molds are scheduled in the program to optimize shell design, mold preheat temperatures and, finally, to produce usable castings for the properties testing phase. Configurations include the fluidity pattern, stress rupture bars, oxidation-thermal fatigue paddles, and Lycoming first stage T55 turbine nozzle vanes. Columbium alloys WC-3015 and B-66 were selected for study. Practice pours of columbium alloy CB-752 and program pours of alloys B-66 and WC-3015 indicate that these materials can be melted and cast into threaded test-bar shapes. Surface quality and soundness of these preliminary castings were acceptable. Surface contamination was not detectable for two of the alloys and only slightly so for the third. Author (TAB)

N70-29947 National Lending Library for Science and Technology, Boston Spa (England).

CARBURIZATION OF STAINLESS STEELS

D. Y. Vishnyakov et al 19 Jan. 1970 9 p refs Transl. into ENGLISH from Tr. Mosk. Aviats. Tekhnol. Inst. (Moscow), no. 50, 1961 p 17 – 27
(NLL-Trans-746-342-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: .2 NLL photocopy coupons

The technological process of carburization of stainless steels in a solid carburizing medium was investigated to select a more active carburizing agent and to prevent the formation of oxide films on the surface of the steel. From the results of the studies, recommendations are given for compositions of carburizing media and protective pastes having a deep and uniform diffusion layer with a hardness of HRC 62-66 after heat treatment. Author

N70-29989*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OPTIMIZATION OF SELF-ACTING STEP THRUST BEARINGS FOR LOAD CAPACITY AND STIFFNESS

Bernard J. Hamrock [1970] 27 p refs Proposed for presentation at Lubrication Conf., Cincinnati, Ohio, 13 – 15 Oct. 1970; sponsored by Am. Soc. of Lubrication Engr. and ASME
(NASA-TM-X-52815) Avail: CFSTI CSCL 13I

A linearized analysis of a finite width rectangular step thrust bearing was performed. Dimensionless load capacity and stiffness are expressed in terms of a Fourier cosine series. The dimensionless load capacity and stiffness were found to be a function of the dimensionless bearing number, the pad length-to-width ratio, the film thickness ratio, the step location parameter, and the feed groo parameter. The equations obtained in the analysis are verified. The assumptions imposed are substantiated by comparison of the results with an existing exact solution for the infinite width bearing. A digital computer program was developed which determines optimal bearing configuration for maximum load capacity or stiffness. Simple design curves are presented. Results are shown for both compressible and incompressible lubrication. Through a parameter transformation the results are directly usable in designing optimal step sector thrust bearings. Author

N70-29996# Mechanical Technology, Inc., Latham, N.Y.

A TWO PHASE FLOW ROTOR BEARING SYSTEM: PREPARATIONS FOR AN EXTENDED (500 HOUR) TEST Progress Report, 1 Oct. – 31 Dec. 1969

E. F. Finkin and S. B. Malanoski Jan. 1970 16 p refs
(Contract AT(30-1)-3839)
(NYO-3839-8; MTI-70-TR-5) Avail: CFSTI

Preparations for a 500-hr-long test on a two-phase flow rotor bearing system using steam as the lubricating process fluid are described. NSA

N70-30038*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A CALCIUM FLUORIDE-LITHIUM FLUORIDE SOLID LUBRICANT COATING FOR CAGES OF BALL BEARINGS TO BE USED IN LIQUID FLUORINE

Harold E. Sliney Washington Jun. 1970 9 p refs
(NASA-TM-X-2033; E-5585) Avail: CFSTI CSCL 13H

Fused fluoride, solid lubricant coatings were applied to machined cages for 50-millimeter bore ball bearings. The cage material is a high strength nickel-beryllium alloy (1.95 Be, 0.50 Ti, remainder Ni). A suspension of calcium fluoride and lithium fluoride in water was sprayed onto bearing cages that were preheated to 60 C. Water rapidly evaporated from the heated surfaces, and the fluorides deposited as a thin, loosely adherent film. The sprayed deposit was built up to a thickness of about 0.005 centimeter. The coated cages were then heated in a two-zone tube furnace containing an atmosphere of dry hydrogen. The deposits were fused at 900 C for 10 minutes in the furnace hot zone, then moved into the cooling zone where the cages were cooled to 100 C in about 15 minutes. The molten fluorides solidified into smooth, dense, strongly bonded coatings about 0.003 centimeter thick. Dimensional changes (shrinkage) occurred in the nickel beryllium alloy when it was heated much above 900 C. For example, after 10 minutes at 1100 C, the outside diameter of the bearing cage had shrunk approximately 0.1 percent. No dimensional changes were noticed in the alloy when the coatings were fired at 900 C. Author

N70-30101# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

NEWS OF INSTITUTIONS OF HIGHER LEARNING: INSTRUMENT MANUFACTURE: SELECTED ARTICLES

R. S. Brekhov et al 26 Nov. 1968 22 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), v. 10, no. 8, 1967 6 p
(AD-683999; FTD-HT-23-557-68) Avail: CFSTI CSCL 13/7

Contents: High-temperature string strain gage; and Elastic characteristics of a cylindrical gas bearing of finite length during angular displacement of its internal cylinder in elementary functions. TAB

N70-30102# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STATIC CHARACTERISTICS OF A RADIAL GAS-DYNAMIC BEARING

Yu. R. Ivanov 18 Sep. 1969 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), v. 10, no.

3, 1967 p 83–86
(AD-700314; FTD-HT-23-595-68) Avail: CFSTI CSCL 13/9

A solution to the differential equation of pressure distribution in a lubricating layer is found in a class of intermediate solutions in compressibility number and coordinate space. Based on the solution for an infinite bearing, an approximate solution for a bearing with finite length is found. Analytical expressions for calculating the static characteristics of a bearing are derived. Author (TAB)

N70-30197*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

STEADY-STATE AND STABILITY ANALYSIS OF EXTERNALLY PRESSURIZED GAS-LUBRICATED JOURNAL BEARINGS WITH HERRINGBONE GROOVES

David P. Fleming Washington Jun. 1970 42 p refs
(NASA-TN-D-5870; E-5489) Avail: CFSTI CSCL 13I

A small eccentricity analysis was performed to predict load capacity and stability. Numerical results were obtained for a range of feeding parameter, pressure ratio, groove length and orifice recess volume for compressibility numbers from 0 to 50. These results were obtained from a digital computer program which is included. Results showed that the addition of heringbone grooving to an externally pressurized bearing increases stability, but reduces load capacity at low compressibility numbers. A fully grooved bearing is more stable than a partially grooved bearing. Orifice recesses reduce stability, especially at high compressibility numbers. Author

N70-30201# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

GLUE-COMPOSITE JOINTS IN TECHNOLOGY

V. N. Shavyrin et al 19 Feb. 1970 284 p refs Transl. into ENGLISH of the book "Kleye-Mekhanicheskiye Soyedinen Ya v Tekhnike" Moscow, Mashinostr., 1968 p 1–231
(AD-703307; FTD-MT-24-389-69) Avail: CFSTI CSCL 11/1

The book deals with a new progressive method for joining of structural aluminum alloy elements production of composite, permanent, glued welded, glued riveted and glued threaded joints of high strength (especially under cyclic load), life, tightness and corrosion resistance. The book contains basic physico mechanical and technological characteristics of structural glues, recommednations on selection of glues and their use in definite composite joints. Given are also strength characteristics of various glued joints, which enable us to compare the performance of various types of joints and select their optimum production techniques. Given are brief recommendations on the design of sheet structures produced by means of glued welded, glued riveted and glued threaded joints as well as their technical and economic effectiveness. The book was written for a wide circle of technologists, designers and scientists of various industrial branches. Author (TAB)

N70-30217# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SOME INVESTIGATIONS OF ANTIFRICTION PROPERTIES OF NONMETALLIC MATERIALS PAIRED WITH BRONZE USING WATER LUBRICATION

V. P. Storozhev 12 Dec. 1969 10 p refs Transl. into ENGLISH from Detali'Mashin i Podemno-Transp. Mashiny (USSR), no. 8, 1968 p 39–43
(AD-702949; FTD-MT-24-313-69) Avail: CFSTI CSCL 13/9

Antifriction properties of nonmetallic materials have been studied on bearings made of caprone, textolite, oak, birch, white beech, lignum vitae, and other materials paired with bronze. The tests were made at rates of 2.2, 3, and 4.1 m/sec under pressures of 0.25, 0.5, 1, 2, and 4 Mn/sq. m. Water was used as the lubricant. The test results are given. Author (TAB)

N70-30249# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

METHODS OF FLASHLESS DROP FORGING

A. D. Bogdan 31 Dec. 1969 15 p Transl. into ENGLISH from Kuznechno-Shtampovochnoe Proizv. (USSR), v. 8, no. 7, 1966 p 35–40
(AD-703011; FTD-HT-23-296-69) Avail: CFSTI CSCL 13/8

The article examines the problems and methods of flashless drop forging for mass production. It compares these methods with those of open-die forging. Author (TAB)

N70-30280# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

METAL SOLDERING

V. F. Lashko et al 18 Sep. 1969 441 p refs Transl. into ENGLISH of the Book 'Paika Metallov' Moscow, Mashinostroyeniye, 1967 p 1–367
(AD-700298; FTD-MT-24-390-68) Avail: CFSTI CSCL 13/8

The book includes material on new varieties of soldering: diffusion, resistance-reaction; the latest achievements in the region of soldering technology of alloys based on aluminum, copper titanium and others are described. Basic information on the physical chemistry fundamentals of processes of soldering are discussed, especially on the interaction of the metal to be soldered with the liquid solder. Practical experience is generalized in the appraisal of the effect of compositions of solders, solderable metals and basic technological factors on the quality of soldered joints. Author (TAB)

N70-30283# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

RESULTS OF STUDYING THE PROCESS OF FILM DEPOSITION OF ELEMENTS FROM THEIR ORGANIC AND CARBONYL COMPOUNDS UNDER THE INFLUENCE OF AN ELECTRON BEAM

B. A. Vishnyakov et al 21 Jan. 1970 19 p refs Transl. into ENGLISH from Fiz.-Tekhn. Vopr. Kibernetiki (USSR), no. 2, 1967 p 90–108
(AD-703000; FTD-HT-23-320-69) Avail: CFSTI CSCL 13/8

Electron beam deposition was used to produce tin and silicon films from their organometallic compounds, and molybdenum carbide films from molybdenum hexacarbonyl. The apparatus used provided an electron-beam current density. The chamber was evacuated before introduction of the organic compound, which again raised the pressure. Tin was deposited on a substrate and heated to 80-200C by an electron flux to yield film. Growth rates of silicon films as functions of current density, substrate temperature, electron energy, and vapor pressure are plotted. Molybdenum carbide deposition was carried out over a substrate temperature range of minus 25-300C at current densities of 0.1-1.2 mA/sq cm. Film growth rates are plotted for these ranges. A brief theoretical treatment of film growth rate is also given and there is good agreement with experimental data. Interferometer measurement of film thickness was accurate. Author (TAB)

N70-30328# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

HIGH-SPEED CUTTING OF LARGE CROSS SECTION OF COLD METAL

V. G. Kononenko et al 7 Oct. 1969 18 p refs Transl. into ENGLISH from Kuznechno-Shtampovochnoe Proizv. (USSR), v. 10, no. 8, 1968 p 8–11
(AD-700394; FTD-MT-24-220-69) Avail: CFSTI CSCL 13/8

The document discusses high-speed cutting of large cross-section billets by means of presses and shears as assuring definite technological and economic advantages, since it can be used for relatively hard-to-cut steels and alloys. The authors propose a procedure for determining the stresses and work of deformation involved in the cutting of billets of square and rectangular cross section, as based on the main equations of continuum mechanics. TAB

N70-30353# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE HARDENING OF A TRANSITION CLASS OF STEEL BY DEFORMATION AT NEGATIVE TEMPERATURES

A. G. Galov et al 15 Dec. 1969 9 p Transl. into ENGLISH from Fis. i Khim. Obrabotki Materialov (USSR), no. 2, 1969 p 86–91
(AD-703005; FTD-MT-24-310-69) Avail: CFSTI CSCL 13/8

The hardening of a transition class of a chromium-nickel-molybdenum steel be dilatational strain at temperatures down to -196C and with subsequent aging treatment was investigated. The effect of the temperature of hardening, and also the temperature and degree of deformation on the mechanical properties was studied. The optimum temperature of hardening was established and a sharp increase in the strength properties with a lowering of the temperature and an increase in the degree of deformation was shown. The effect of temperature and duration of aging of the hardened steel was investigated and a considerable positive effect of the overall treatment was shown. A comparison of the sensitivity to the propagation of cracks of widely used structural steels and steels hardened by deformation at negative temperatures, shows considerable advantage over the latter.
Author (TAB)

N70-30354# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SUBSTANTIATION OF REQUIREMENTS FOR THE PURITY OF THE FACE SURFACES OF COMPONENTS SERVING FOR THE ASSEMBLING OF INSTRUMENT BALL-BEARING SUPPORTS

Yu. K. Laptev 27 Jan. 1970 10 p ref Transl. into ENGLISH from Moskovskaya Konf. Molodykh Uch., 1st Obshch. Probl. Mashinostroeniya, Tr. (Moscow), 1967 p 166–177
(AD-702983; FTD-HT-23-322-69) Avail: CFSTI CSCL 13/9

The quality and life of many present-day devices and machines is markedly influenced by the precision of assembling of ball-bearing supports. Misalignment of the axes of bearing races affects the moment of friction, vibration and service life of the supports. To restrict this misalignment, the surfaces of parts serving to mount the bearings must meet high requirements as to precision of location. Thus, in elements of many gyroscopic instruments the off-axial tolerances for cylindrical surfaces and for the perpendicularity of their ends often are small. In such cases, however, the purity of plane surfaces is selected without sufficient substantiation. It is shown that the roughness of plane surfaces of the parts of devices serving to mount ball-bearing supports may introduce errors similar to errors due to off-perpendicular position of these surfaces with respect to the axes of cylindrical surfaces and the off-axiality of these surfaces.
Author (TAB)

N70-30375# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DYNAMICS OF THE PROCESS OF ELECTRICAL EROSION OF METALS BY ELECTRIC PULSE DISCHARGE

B. N. Zolotykh 18 Nov. 1969 33 p refs Transl. into ENGLISH from Tr. Soveshchan. po Elektr. Kontakty (Moscow), 1958 p 27–49
(AD-702998; FTD-MT-24-306-69) Avail: CFSTI CSCL 13/8

The author explains briefly the theoretical fundamentals of this phenomenon and discusses in detail its basic regularities, the additivity law, the relation between erosion volume and spark energy, the relation between erosion volume and thermal constants of metals, the polarity of electric erosion and its relation to pulse duration. He reports results of experimental investigation of the formation of spots and indentations on electrode surfaces caused by single pulse discharge.
Author (TAB)

N70-30419# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EFFECT OF THE DEGREE OF COLD DEFORMATION AND SUBSEQUENT ANNEALING ON PROPERTIES OF SHEET SEMIFINISHED PRODUCTS OF SAP

A. I. Paisov et al 16 Oct. 1969 14 p refs Transl. into ENGLISH from Aviats. Tekhnol. Inst., Tr. (Moscow), no. 69, 1968 p 106–111
(AD-700393; FTD-MT-24-279-69) Avail: CFSTI CSCL 11/6

Bars 20 mm thick hot rolled from degassed SAP-1 powder were rolled first at 450 degrees centigrade into plates 3 and 10 mm thick, and then cold rolled with a reduction of 50 or 85 percent without process annealing into sheets of the same thickness. The sheets after annealing at 600 degrees centigrade for 2 and 20 hr., at 640 degrees centigrade for 2 and 20 hr., and at 670 degrees centigrade for 2 min., 20 min., and 20 hr. were subjected to tensile tests at 20, 350, and 500 degrees centigrade at a rate of 5 mm/min with a holding time of 15 min at elevated temperatures.
Author (TAB)

N70-30493# Army Foreign Science and Technology Center, Washington, D.C.

THE FIFTIETH ANNIVERSARY OF THE CENTRAL SCIENTIFIC RESEARCH INSTITUTE FOR AUTOMOBILES AND AUTOMOBILE ENGINES

A. M. Khlebnikov et al 19 Feb. 1970 20 p Transl. into ENGLISH from Avtomob. Prom. (Moscow), v. 34, no. 11, 1968 p 3–8
(AD-703205; FSTC-HT-23-221-70) Avail: CFSTI

An historical sketch is given of the Central Scientific Research Institute for Automobiles and Automobile Engines (NAMI) from its conception on November 6, 1918 to October 24, 1967.
TAB

N70-30496# Mechanical Technology Inc., Latham, N.Y.

A QUALITATIVE STUDY OF GAS BEARINGS OPERATING AT HIGH SUBSONIC AND SUPERSONIC TANGENTIAL SPEEDS

V. N. Constantinescu and F. C. Hsing Mar. 1970 43 p refs
(Contract N00014-70-C-0135)
(AD-703287; MTI-70TR14) Avail: CFSTI CSCL 13/9

The results of a preliminary study of the Mach-number effect, based on the usual lubrication assumptions except for the retention of convective terms in the equations of motion, are presented. The essential step in this analysis is to adopt the momentum integral method - i.e., to assume a velocity profile satisfying the prescribed boundary conditions. The first attempt is to assume a second-order polynomial for the velocity profile. Although this may not give enough detail of the velocity field, the results should give more insight into this problem. Analytical results based on perturbation theory are presented for journal, slider, and step bearings. Numerical results for a plane slider are also presented. All results indicate that when a dimensionless mean-speed parameter - namely, the modified Mach number - approaches unity, the pressure field converges very quickly to the limiting solution ph = a constant even at moderate values of the compressibility number. In addition, both the small perturbation analysis and the numerical results reveal that, under some circumstances - e.g., in a plane slider - the pressure boundary condition at the trailing edge should be modified in order to obtain a physically meaningful solution.
Author (TAB)

N70-30566# Fraunhofer-Gesellschaft zur Forderung der Angewandten Forschung e. V., Lindau (West Germany). Technische Forschungs- und Entwicklungsstelle.

INVESTIGATION OF ECCENTRICALLY ROTATING AXIAL SEALS FOR FLUIDS [UNTERSUCHUNG EXZENTRISCH KREISENDER AXIALDICHTUNGEN FUER FLUESSIGKEITEN]

G. Hoffmann *In its* Examples of Appl. Res. Jun. 1969 p 93–98
In GERMAN (See N70-30551 15-34)
Avail: CFSTI

A special seal with a sharp edge was made to prevent cooling oil leaking into the combustion chambers of internal combustion engines with rotating pistons (Wankel principle). The optimal form of this seal was investigated and was found to be unimportant. ESRO

N70-30671# Laboratorium fur Betriebsfestigkeit, Darmstadt (West Germany).

FORGED AND CAST AUTOMOBILE PISTON RODS OF THE SAME STRUCTURAL STRENGTH [GESCHMIEDETE UND GEGOSSENE FAHRZEUGPLEUEL GLEICHER GESTALTFESTIGKEIT]

V. Grubisic and H. Ostermann *In* Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 124 – 128 refs In GERMAN (See N70-30551 15-34)
Avail: CFSTI

The possible use of cast steel instead of forged steel in automobile piston rods was investigated by stress analyses and found to be quite suitable. ESRO

N70-30600# Sandia Corp., Albuquerque, N. Mex.

INTERLOCKING TWO-PIECE NUT

F. C. Dain Feb. 1970 5 p Sponsored by AEC
(SC-DR-69-719) Avail: CFSTI

A two-piece nut is described, which can be installed on a threaded cable terminal, or similar fitting, after the cable is made up or assembled. Author

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid State.

N70-29291# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

LOCAL CASE-HARDENING OF STEEL BY LASER RADIATION

V. F. Brekhovskikh et al 13 Oct. 1969 20 p refs Transl. into ENGLISH from Fiz. Khim. Obrabotki Materialov, no. 4, 1968 p 35 43
(Contract NOw-62-0604-c)
(AD-700354; APL-CLB-3-T-614) Avail: CFSTI CSCL 13/8

The hardening of steel in the zone of action of focused radiation from a laser in the free-generation mode and with modulated-Q is considered. The maximum extent of the hardened areas is estimated, taking into account the characteristics of the laser radiation. The heating and cooling rates of the material were determined theoretically. The surface hardening of metal products is of much interest in machine design. A great many methods of surface hardening of metals are known: high-frequency current hardening, volume hardening of PP (low-annealing) steels, volume hardening of cemented and nitro-cemented items, etc. With the exception of the electron beam all other methods of surface hardening do not permit obtaining case-hardening of micro-regions to a depth of some tens or hundreds of microns. However, use of an electron beam is not always warranted due to the high cost of the equipment and the requirement for placing the item being treated in a vacuum. Experiments have shown that after laser treatment of the surfaces of U8, 45, KhVG and other steels, the micro-hardness in the treatmant zone is increased from 300-400 up to 900-1000 kg/sq mm, and in certain cases to 2200 kg/sq mm. In this connection it is of interest to discuss some aspects of the possible use of laser radiation for the thermal treatment of steels and alloys. The paper analyzes some experimental data on the surface hardening of a number of steels and theoretical estimates are made of the dimensions of the regions of hardening obtained after irradiation by a laser. Author (TAB)

N70-29311# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

JOURNAL OF APPLIED SPECTROSCOPY, VOLUME 7, NO. 3, 1967

A. N. Rubinov et al Aug. 1968 61 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskopii. Akad. Nauk Belorussk. SSR (MINSK), v. 7, no. 3, 1967 p 327 348, 354 359
(AD-685420; FTD-MT-24-187-68) Avail: CFSTI CSCL 20/5

Table of contents: Excitation of generation in solutions of thirteen organic dyes with the aid of a giant ruby-laser pulse; Occurrence of angular oscillation modes when the resonator mirror of an OKG is tilted; Investigation of temperature deformation of ruby-laser crystals; Photoelectric method of investigating distribution of pumping over the cross section of laser rods; Influence of rate of switching of the optical cavity on characteristics of laser emission. TAB

N70-29316# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

THE THERMAL REGIME OF A GAS LASER

L. N. Orlov 23 Oct. 1969 11 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR (Minsk), v. 13, no. 6, 1969 p 498 501
(Contract NOw-62-0604-c)
(AD-700358; APL-CLB-3-T-606) Avail: CFSTI CSCL 20/5

The relationships between the wall temperature of a He-Ne laser tube and the generated power are examined. It is pointed out that the tube wall temperature can be increased by inhibiting heat transfer. This can be realized for example by placing the laser in an evacuated cavity with reflecting walls, in which case the tube wall temperature can reach 170 - 190 C. Author (TAB)

N70-29446# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

NEWS OF INSTITUTIONS OF HIGHER LEARNING, MATHEMATICS (SELECTED ARTICLES)

I. L. Bershtein et al 27 May 1968 39 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radiofiz. (USSR), v. 10 no. 1, 1967 15 p
(AD-681396; FTD-HT-23-370-68) Avail: CFSTI CSCL 20/5

Contents: Fluctuation of laser-emission intensity and frequency; Parametric amplification of light in a nonlinear medium with random inhomogeneities; The optimal variant of a two-resonator molecular generator with opposing beams; Parametric amplification with multimode pumping. TAB

N70-29488# RAND Corp., Santa Monica, Calif.

SMALL-ANGLE SCATTERING OF LIGHT BY OCEAN WATER

H. T. Yura Jan. 1970 27 p refs
(Contract DAHC15-67-C-0141; ARPA Order 189-1)
(AD-701330; RM-6066-ARPA) Avail: CFSTI CSCL 20/5

A semi-quantitative analysis of the mechanisms involved in very intense, small-angle forward scattering of light by ocean water. Two important mechanisms described are (1) suspended biological particles in the water having an index of refraction close to that of water and (2) deviations of the light beam due to large-scale refractive index variations. When the modulation transfer function (MTF) associated with these mechanisms is calculated, a complete statistical description is obtained for the transverse coherence properties of the beam as a function of the propagation distance. Some numerical estimates are given of the MTFs that might be expected under various conditions. Author (TAB)

N70-29694# Avco-Everett Research Lab., Everett, Mass.

LASER PLANOGRAM MEASUREMENTS OF TURBULENT MIXING STATISTICS IN THE NEAR WAKE OF A SUPERSONIC CONE

A. M. Schneiderman, and G. W. Sutton Mar. 1970 20 p refs
(Contract F04701-69-C-0122; ARPA Order 1092)
(AD-702442; AERL-AMP-298; SAMSO-TR-70-62) Avail: CFSTI

CSCL 20/4

The laser planogram technique is a new method for the study of turbulent mixing. It utilizes a pulsed laser and a particulate tracer to determine the spatial mixing field of tagged and untagged fluids. The laser planogram technique is described along with design considerations. As an example of its implementation, laser planogram measurements were obtained and analyzed to provide turbulent mixing statistics in the wake of a cone at a Mach number of 2.5, and a Reynolds number of 3,000,000. The mean radial concentration profile of tagged material is shown to be a Gaussian in agreement with theory. A (k exp -5/3) spectral dependence on wave number is observed which is characteristic of high turbulent Reynolds number flows. Experimental limitations prevent the resolution of the turbulent scale lengths in the present experiment although the integral scale should be easily resolved with increased data length. Author (TAB)

N70-29842# Akademiya Nauk URSR, Kiev.
TRANSMITTING A UNIFORMLY BRIGHT CIRCULAR IMAGE OVER AN OPTICAL CHANNEL
B. A. Popov and A. A. Smerdov *In its* Data Collection and Transmission, No. 18 p 82-89 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

A rigorous analysis is made of the factors governing the transmissibility of a uniformly bright circular image through a light-scattering medium. The space frequency spectrum of the transmitted image is expressed by Fourier transformation; this together with the optical transfer function of the assumed channel yields the image intensity distribution in the receiving plane. Since rigorous solutions of this problem are laborious even with computer use, simplified expressions are offered which give sufficiently accurate values of received image brightness for practical design purposes. Transl. by B.E.S.

N70-29986# United Aircraft Corp., East Hartford, Conn. Research Labs.
PASSIVELY Q-SWITCHED N2O LASER
John H. Mc Coy Jan. 1970 10 p refs Submitted for publication
(Contract N00014-69-C-0308)
(AD-700334; UAR-J17) Avail: CFSTI CSCL 20/5

Freon-12 and SF-6 were used to passively Q-switch laser transitions in N2O. Pulses having a half intensity width to 0.75 microseconds with peak powers 10 to 20 times the cw power were observed. Author (TAB)

N70-30024# General Telephone and Electronics Labs., Inc., Bayside, N.Y. Bayside Research Center.
HIGH-ENERGY PULSED LIQUID LASER Annual Technical Summary Report, 1 Jan. - 31 Dec. 1969
H. Samelson, A. Lempicki, C. Brecher, R. Kocher, and R. R. Alfano 30 Jan. 1970 135 p refs
(Contract N00014-68-C-0110)
(AD-702105; GT/E-TR-70-826.10) Avail: CFSTI CSCL 20/5

The report covers the development of circulatory liquid lasers based on Nd(+3) in aprotic solvents. The static laser properties of three systems, SeOCl2:SnCl4, POCL3:SnCl4 and POCL3:ZrCl4, are presented in detail. It is shown from the point of view of gain, efficiency and loss, that the first and third systems are equivalent, while the second exhibits some degree of solubility instability. Chemically, the POCL3:ZrCl4 represents a significant improvement in that it has a much decreased toxicity and is much less chemically reactive. Finally, it is shown that the losses, while high, are not excessive for pulsed systems. Investigation of the nonlinear properties of these liquid laser materials shows that they are capable of sustaining such effects, but they are not self-focusing liquids. The nonlinear properties observed occur at high thresholds and should present no performance limitations for non-Q-switched operation. The design and operating characteristics of all the components for a circulatory laser system are described in detail, including the pump, the cell, the heat exchanger and associated tubing. In addition, the characteristics of the flash tubes, the laser head, the power supply and the energy storage unit to be used in the repetitively pulsed laser application are described. Author (TAB)

N70-30112*# National Aeronautics and Space Administration. Electronics Research Center, Cambridge, Mass.
LASER BREAKDOWN OF COPPER VAPOR
Victor E. Scharrer Washington Jun. 1970 10 p refs
(NASA-TN-D-5848; C-123) Avail: CFSTI CSCL 20E

A technique for generating a plasma by combined deposition of energy from an electrical discharge and focused laser light is described. Initial heating was by electrical discharge. This was followed by optical heating, using a Q-switched ruby laser. Measurements were made of the optical power per unit area, required to produce breakdown in the expanding copper vapor. It was found that breakdown was produced for laser power per unit area of 10 to the 9th to 10 to the 10th power watts/sq cm. Author

N70-30237# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OPTICAL-MECHANICAL INDUSTRY (SELECTED ARTICLES)
I. N. Davydova et al Nov. 1968 24 p ref Transl. into ENGLISH from Optiko-Mekh. Prom. (Leningrad), v. 35, no. 2, 1968 p 6-10, 38-41
(AD-684285; FTD-HT-23-810-68) Avail: CFSTI CSCL 20/5

Contents: Allowance for backscattering of a laser beam along inclined trajectories; Inclusions in neodymium glasses. TAB

N70-30317# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE QUESTION OF THE POSSIBILITY OF OPTICAL COOLING
P. A. Arsenev et al 5 Sep. 1969 7 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 8, no. 4, 1968 p 610-611
(AD-701993; FTD-HT-23-473-69) Avail: CFSTI CSCL 20/5

The possibility of cooling a ruby single crystal by means of an external source of monochromatic light was predicted theoretically. Experiments proving the possibility in principle of such a cooling mechanism in ruby single crystals were conducted by means of two identical laser elements containing 0.05 percent Cr(+3). One of them, located in a closed cavity, was illuminated by induced emission of the other and its luminescence at that moment was measured with a DFS-13 spectrograph. As a result of the experiments, we detected luminescence of a ruby with R1 and R2 lines during its illumination by pulsed emission of a ruby laser through a red light filter; the ratio of intensities was equal to 0.3. Blind experiments - without a crystal to be cooled or with the crystal replaced by a sapphire single crystal - confirmed the impossibility of illumination of the cooled crystal by extraneous emission. In this way the possibility of the mechanism described above was confirmed. Author (TAB)

N70-30369# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NONLINEAR DISTORTIONS DURING MODULATION OF THE RADIATION OF A SEMICONDUCTOR LASER
Yu. A. Skomorovskiy et al 3 Oct. 1969 14 p refs Transl. into ENGLISH from Poluprov. Prib. v Tekhn. Elektrosvyazi (Moscow), 1967 p 217-223
(AD-700706; FTD-MT-24-223-69) Avail: CFSTI CSCL 20/5

Nonlinear distortions which occur when a semiconductor laser is modulated by a broad band signal are analyzed. These distortions are produced by the elements of the modulator and by the nonlinear impedance of the p-n junction. TAB

N70-30416# American Optical Co., Southbridge, Mass. Central Research Lab.

RESEARCH AND DEVELOPMENT OF HIGH QUALITY LASER GLASS Semiannual Technical Report, Period Ending 30 Dec. 1968

Richard F. Woodcock and Carl G. Silverberg Feb. 1970 21 p
(Contract N00014-68-C-0192; ARPA Order 306)
(AD-701315; TR-607-2; SATR-2) Avail: CFSTI CSCL 11/2

The goal is to determine the feasibility of producing high optical quality laser glass in an all-ceramic melting system. Such a system should eliminate the presence of small platinum particles, found in the glasses melted in platinum crucibles, which serve as laser damage sites. The main problem at the present time is that of obtaining good optical quality glass in large volumes. In order to examine the optical quality problem more thoroughly, a study of the stirring process was initiated. A simulated melting system was set up in which the stirring action in cooled glycerin is studied as a function of stirrer design, viscosity of medium being stirred and stirring cycles. During this period work was performed in two general areas: Namely, (1) studies with and improvements in the cooled glycerin system used for investigating stirring action in the melt, and (2) analysis of damage sites produced in glass made from the all-ceramic melting system in an attempt to determine their origin. Author (TAB)

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N70-29213# Combustion Engineering, Inc., Windsor, Conn. Nuclear Power Dept.

VANADIUM PURIFICATION Final Report

J. C. LaVake and C. T. Wang (Wah Chang Corp.) Nov. 1969 129 p refs
(Contract AT(30-1)-3742)
(CEND-3742-356) Avail: CFSTI

The development of a commercially adaptable process to produce high purity vanadium is discussed. A V-15Cr-5Ti alloy was melted, fabricated into sheet, and the mechanical properties evaluated. Several ingots with a total interstitial content of <400 ppM were melted. Starting material, in all cases, was V2O5 which was aluminothermically reduced and subsequently electron beam melted to desired purity. Alloying was performed by vacuum and inert gas arc melting composite electrodes of vanadium, chromium and titanium chips. Alloy sheet, 0.040-inch thick, was produced by upset or side forging followed by hot and warm rolling. Tensile and stress-rupture tests performed on the sheet showed that the V-15Cr-5Ti alloy exhibits good strength characteristics without the added strengthening of a high interstitial content. Weld studies show that the alloy is susceptible to embrittlement as a result of TIG welding, due to coring. Electron beam welding showed weld properties similar to parent metal properties when tensile and stress-rupture tested. Author (NSA)

N70-29220# General Electric Co., Schenectady, N.Y. Knolls Atomic Power Lab.

EFFECT OF WARM PRESTRESSING ON PRESSURE VESSEL STEEL

W. R. Andrews and E. E. Baldwin Jul. 1969 45 p refs
(Contract W-31-109-eng-52)
(KAPL-P-3826) Avail: CFSTI

An experimental study of the effects of warm prestressing on the fracture strength of notched and fatigue-cracked bend bars of A508 class 2 low-alloy steel was conducted. The steel was tested in four conditions simulating four thickness fractions of a 23-1/2 in. thick forging. Three load-temperature paths investigated were preload-cool-fracture, preload-cool-unload-fracture, and preload-unload-cool-fracture. The fracture strengths of the prestressed bars were compared with the fracture strengths of unprestressed bars. The benefits of prestressing for each load-temperature path decreased in the order listed, although prestressing was always beneficial. The benefits also decreased with decreasing fracture-test temperature relative to the reference transition temperature. Aging at 500 F after prestressing produced a small deleterious effect which may have been caused by relaxation of residual stresses at the crack tip. Author (NSA)

N70-29345# Iowa State Univ. of Science and Technology, Ames.

DETERMINATION OF DIFFUSION COEFFICIENTS IN LIQUID In-Sn SYSTEM

John Charles Wenger (M.S. Thesis) Nov. 1969 67 p refs
(Contract W-7405-eng-82)
(IS-T-343) Avail: CFSTI

Values of the diffusion coefficient were determine over the entire composition range of the indium-tin system at 300 C. A variation of the capillary reservoir technique was used. Values of the diffusion coefficient, D, range between 0.0000233 sq cm/sec and 0.0000315 sq cm/sec depending on concentration. A minimum occurs in the middle concentration range. Results of diffusion runs indicate density convection and it is believed the indium-tin system goes through a minimum density in the 20 to 30% indium range. No density data are recorded for the indium-tin system to establish such a minimum. Author (NSA)

N70-29358 Purdue Univ., Lafayette, Ind.

EXPERIMENTAL INVESTIGATION AND THE REFLECTIVITY OF Al, Cu, Zn AND Ni AND ITS COMPARISON WITH THEORY

Jack Sinn-goe Hsia (Ph.D. Thesis) 1968 132 p
Avail: Univ. Microfilms: HC $6.40/Microfilm $3.00 Order No. 69-7460

This study is to generate accurate experimental results on reflectivity of metals and to compare them with the predictions made by theoretical models and also to predict values in longer wavelength range not covered by this experiment. The theories of the reflectivity of metals are first reviewed with respect to macroscopic and microscopic points of view. Measurements of normal spectral reflectivity were made on the bulk surface of the pure metallic elements, copper, zinc, and nickel and high vacuum evaporated surface of pure aluminum. The absorptivity predicted by the theory of anomalous skin effect assuming diffuse electronic reflection, one electron per atom, and bulk conductivity, is found to have lower values than those obtained in the present experiment. On the other hand, the prediction which is made by the simple equation derived from quantum theory is found to fit well with the experimental results. Dissert. Abstr.

N70-29375# General Electric Co., Sunnyvale, Calif. Breeder Reactor Development Operation.

CORROSION AND MASS TRANSPORT OF STAINLESS STEELS IN SODIUM SYSTEMS

Prodyot Roy and Maxine F. Gebhardt Sep. 1969 29 p
(Contract AT(04-3)-189)
(GEAP-13548) Avail: CFSTI

Mass transport and corrosion of austenitic stainless steels in flowing sodium systems were the subject of several investigations. Broad correlations between materials behavior and experimental parameters were observed and all studies are in general agreement. In order to explore the limits of performance at potential hotspot conditions, extended corrosion studies were conducted at 1300 F involving the effects of alloy compositions and of heat transfer. A more detailed evaluation of the effects of velocity and distance downstream was also made. These studies were conducted in flowing sodium for periods up to 3000 hours with oxygen levels of less than 10 ppM. NSA

N70-29390# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.

EVALUATION OF DUAL-HARDNESS TITANIUM ALLOY ARMOR Final Report, 17 Mar. 1969 – 17 Mar. 1970

Roger A. Perkins and Elliott H. Rennhack Jan. 1970 99 p refs
(Contract DAAG46-69-C-0047)
(AD-702238; AMMRC-CR-70-C) Avail: CFSTI CSCL 11/6

A program to evaluate the producibility and ballistic characteristics of dual-hardness titanium utilizing a new class of high-hardness titanium alloys has been conducted. The results of studies to optimize the composition and heat-treatment schedules for the hard alloys are presented. The approach to melting and fabrication of 25-lb ingots of these alloys is discussed. Factors influencing the selection of a suitable back-face alloy are reviewed, and methods for preparing dual-hardness cc.npnsite test plates from the optimum materials are detailed. Results of ballistic tests with 0.30- and 0.50-cal AP/M2 projectiles are presented and correlated with the metallurigcal structure and properties of the composites. An assessment of the technical feasibility of producing an effective dual-hardness titanium armor based on this concept is made, and recommendations for continuing work are presented. Author (TAB)

N70-29398 National Lending Library for Science and Technology, Boston Spa (England).

CORROSION RESISTANCE OF WELDS OF AUSTENITIC STEELS IN NITRIC ACID SOLUTIONS

L. K. Zamiryakin et al 6 Feb. 1970 9 p refs Transl. into ENGLISH from Zashch. Metal. (USSR), v. 5, no. 4, Jul.–Aug. 1969 p 422–427
(NLL-LTI-746-360-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

The corrosion resistance of the alloys was determined according to the surface conditions of the samples and by weight loss. Welds of austenitic Cr-Ni steels are corrosion resistant in solutions containing up to 300 g/1 HNO3 and 400 g/l NINO3, while welds of 18Cr-12Ni-Nb and 18Cr-10Ni-Ti show greatest resitance to corrosion in these solution. The addition of nitrate salt and nitric acid to the solution increases the rate of general corrosion and leads to the appearance of special forms: intergranular, knifeline, and pitting corrosion. Author

N70-29429# Iowa State Univ. of Science and Technology, Ames.

EFFECT OF SOLUTES FROM THE SIXTH PERIOD OF THE PERIODIC TABLE ON THE MELTING POINT AND THE ALLOTROPIC TRANSFORMATION TEMPERATURE OF PRASEODYMIUM

Richard Bruce Griffin (Ph.D. Thesis) Nov. 1969 138 p refs
(Contract W-7405-eng-82)
(IS-T-328) Avail: CFSTI

The effects of the elements of the sixth period, Cs through Bi excluding the lanthanides, on the melting point and the allotropic transformation temperature of Pr were investigated. The equilibrium diagrams were studied at the Pr-rich end by differential thermal, chemical, metallographic and X-ray techniques. Author (NSA)

N70-29464# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.

PREDICTING THE PERFORMANCE OF ARC-CAST TUNGSTEN CAPSULES CONTAINING ALPHA-EMITTING ISOTOPES AT THERMIONIC TEMPERATURES

R. W. Swindeman Feb. 1970 40 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2809) Avail: CFSTI

The performance of arc-cast tungsten under conditions typical of a nonvented capsule containing Cm-244 was studied. Creep data available in the literature were used to generate several flow models describing the temperature and stress dependence of the creep rate or the time to a specific strain. These flow equations were then combined with a cumulative creep model and the temperature-stress profile typical of a fuel capsule. Solution of several such models indicated that the predicted performance of arc-cast tungsten is not particularly sensitive to either the flow equation or the cumulative creep model to longer than 10,000 hr over the range from 1600 to 2000 C. Author (NSA)

N70-29477# Sandia Corp. Albuquerque, N.Mex.

COMPUTER SIMULATION OF STRESS CORROSION CRACKING

Bruce D. Mc Laughlin Jan. 1970 39 p refs
(SC-RR-69-828) Avail: CFSTI

By assuming that the electrochemical oxidation mechanism of crack propagation is not supplemented by mechanical fracture or plastic deformation during the early stages of crack growth and that the equilibrium rate of a charge transfer half-reaction, occurring at the interface between two phases, is dependent upon the local surface tension at the point of reaction, it is demonstrated that it is possible to account for the general aspects of stress corrosion cracking such as the existence of an incubation period, the existence of a threshold stress, the variation of incubation time with overpotential, and the variation of incubation time with applied stress. Author (NSA)

N70-29488 National Lending Library for Science and Technology, Boston Spa (England).

CORROSION WITH ZINC AND ZINC ALLOYS

J. Tandberg 28 Nov. 1969 9 p Transl. into ENGLISH from TVF (Tek.-Vetenskaplig Forskning) (Stockholm), v. 22, 1951 p 167–169
(NLL-M-7976-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

The corrosion effects of impurities in zinc and zinc alloys were studied. It is shown that lead is very detrimental for zinc castings. Zamak, which are zinc-aluminum-copper-magnesium alloys are recommended for casting. For zinc alloys, synthetic paints are preferred to linseed oil paints as traces of formic acid develop when drying, and zinc formate, which is readily soluble in water, is formed. In hot-zincing, antimony is the detrimental impurity. F.O.S.

N70-29519# California Univ., Berkeley. Lawrence Radiation Lab.

THE EFFECT OF STACKING FAULT ENERGY ON THE STRAIN INDUCED MARTENSITE TRANSFORMATION AND TENSILE CHARACTERISTICS IN IRON BASED ALLOYS

John S. Dunning Dec. 1969 119 p refs
(Contract W-7405-eng-48)
(UCRL-19052) Avail: CFSTI

Two series of iron based alloys, one carbonless and the second containing carbon, were designed such that a regular variation of stacking fault energy (S.F.E.) in the range 10 to 50 ergs/sq. cm. was obtained while maintaining a constant M sub s temperature within each series. The austenitic alloys were transformed to martensite under the influence of tensile strain at cyrogenic temperatures. Transformation characteristics were found to vary in a consistent fashion within each series of alloys. In alloys with high S.F.E. the martensite formed during tensile straining formed in massive blocks or large fragmented plates. In low S.F.E. alloys, however, the transformation products observed were extremely fine. The effect of prior deformation on subsequent strain induced transformation varied considerably between the two alloy series. Differences in composition both within and between the two series of alloys resulted in a variation in response to prior deformation. Author (NSA)

N70-29535# MSA Research Corp., Evans City, Pa.

SYNOPSIS OF THE EFFECTS OF ENVIRONMENTS ON THE MECHANICAL PROPERTIES OF 304 AND 316 SS

R. C. Andrews and L. H. Kirschler 8 Dec. 1969 1 p *Its* MSAR Inform. Chart 69-2
(Contract AT(11-1)-765)
(TID-25337) Avail: CFSTI

Information is presented in a chart-type synopsis on stainless steel tensile properties at 73, 1200, and 1400 F in air as compared with atmospheres of He and environments of Na, Na−O, and Na−C. A use guide is included. NSA

N70-29603# Oak Ridge National Lab., Tenn.

FABRICATION HISTORY OF THE THIRD AND FOURTH ASTM A-533 STEEL PLATES OF THE HEAVY STEEL TECHNOLOGY PROGRAM

C. E. Childress Feb. 1970 112 p refs
(Contract W-7405-eng-26)
(ORNL-4213-2) Avail: CFSTI

Two additional 12-in.-thick A-533 grade B steel plates were purchased for evaluation. They were received for heat treatment in the asrolled, stress relieved, and descaled condition. It was decided to reroll portions of one plate to 8-in. and 4-in. gage and heat treat portions of the material to class 2 properties. Since plates 01 and 02 were vertically quenched, it was decided to horizontally quench the second pair to test the effects of the quenching procedure. All material was ultrasonically inspected before and after heat treatment in accordance with PVRC specifications. An objective account of the history of the latest HSST plates is presented. Author (NSA)

N70-29606# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STRUCTURE OF MOLYBDENUM AND TUNGSTEN FILMS OBTAINED BY THERMAL DECOMPOSITION OF THE CARBONYLS IN VACUUM

N. N. Matyushenko et al 20 Aug. 1969 7 p refs Transl. into ENGLISH from the Russian
(AD-700312; FTD-HT-23-540-68) Avail: CFSTI CSCL 11/6

The texture and morphology of Mo and W films obtained from the corresponding carbonyls at 150-1000C were studied. Initially, films with mirror brightness were obtained. The finely dispersed structure was retained up to 250C for Mo and up to 350C for W. Above these temperatures drop-like formations developed. The size of these drops increased to a maximum at 600C for Mo and at 700C for W. Above these temperatures the size decreased and finally vanished at 700C for Mo and at 800C for W. The morphological structure on substrates of Mo, W, Ta, Nb, and Ti is similar. At 450-650C the (111) texture of Mo films dominated, whereas at 750-1000C the preferred orientation was (100). At 650-750C both textures were present. The morphological changes affected the reaction between crystal planes and the gaseous medium. Author (TAB)

N70-29679# British Steel Corp., London (England). Scottish and North West Group.

THE ASSESSMENT OF FERRITE GRAIN SIZE BY QUANTIMET IN FERRITE/PEARLITE MICROSTRUCTURES

S. Goold and T. Kelly 1969 6 p
(PB-187824; SNW(C)V-74/10) Avail: CFSTI CSCL 11F

The accuracy of measurement of pearlite volume fraction and ferrite grain size by Quantimet are discussed. Quantimet results are compared with those of manual linear traverse measurements and shown to be accurate to within acceptable limits, at most plus or minus 10, but usually plus or minus 5%, based on standard deviation/mean %. Author (USGRDR)

N70-29687# Battelle Memorial Inst., Columbus, Ohio.

MECHANICAL-PROPERTY DATA 5Al-6Sn-2Zr-1Mo-0.25 Si TITANIUM: AGED FORGING

1969 9 p refs
(Contract F33615-69-C-1115)
(AD-701114) Avail: CFSTI CSCL 11/6

5621-S alloy is a new high-temperature titanium alloy. The alloy was developed to meet the need for a titanium alloy capable of withstanding temperatures as high as 1000 F for long periods. 5621-S contains silicon which enhances high temperature creep strength. This alpha-matrix alloy is reported to have moderate room temperature tensile strength, excellent notch toughness, fatigue and creep strength, hot salt stress corrosion resistance, and thermal stability. It is reported to have greater creep strength than any other commercially available titanium alloy. Author (TAB)

N70-29702# Martin Marietta Corp., Denver, Colo. Research and Development Dept.

THE EFFECT OF ENVIRONMENT ON THE MECHANICAL BEHAVIOR OF MATERIALS Annual Report, Jan. – Dec. 1969

Irvin R. Kramer Jan. 1970 37 p refs
(Contract F44620-69-C-0065)
(AD-701106; MCR-70-21; AFOSR-70-0376TR) Avail: CFSTI CSCL 11/6

The cyclic creep behavior of aluminum 7075-T6 and titanium (6Al/4V) was investigated in air and in vacuum. The cyclic creep decreased in vacuum. The kinetics for the relaxation of the surface layer stress in copper appear to follow a first-order reaction rate with respect to the surface layer stress. The apparent activation energy for the process is 3340 calories per mole. This low activation energy can be accounted for by a driving force imposed by the surface layer. The behavior of copper and titanium in media that cause stress corrosion cracking was investigated. These media caused the surface layer stress to increase appreciably. A tentative theory for stress corrosion is suggested. Author (TAB)

N70-29729*# Pratt and Whitney Aircraft, East Hartford, Conn.

RESEARCH ON THE PROPERTIES OF BINARY LIQUID METAL SYSTEMS WITH LITHIUM AS ONE COMPONENT: THE ELECTRICAL RESISTIVITY OF LIQUID LITHIUM SATURATED WITH CESIUM Final Report

F. F. Felber, Jr., S. M. Kapelner, and K. A. Helgeson 13 Feb. 1970 37 p refs Prepared for JPL
(Contract NAS7-658)
(NASA-CR-110370; PWA-3877) Avail: CFSTI CSCL 11F

The electrical resistivity of a saturated solution of cesium in liquid lithium has been measured in the temperature range from 770C to 1100 C by a high precision potentiometric technique and compared with the electrical resistivity of the same sample of liquid lithium measured independently in the same container. Matthiessen's rule is obeyed to approximately 900 C confirming the low solubility of cesium in liquid lithium. The impurity atom resistivity of cesium is less than one microhm-centimeter over this range, increasing to three microhm-centimeters at 1094 C. The temperature dependence of the electrical resistivity of a saturated solution of cesium in lithium can be expressed by the following equation: rho = 41.97 −0.01585t + .00002271t sq where rho is the electrical resistivity in microhm-centimeters and t is in degrees Centigrade. The electrical resistivity of the liquid lithium as a function of temperature in the temperature range 365 C to 973 C is: rho = 21.48 +0.03170t −.000005913t sq. These results indicate that cesium solubility would not significantly alter the generator efficiency with liquid lithium as the conducting fluid in a lithium-cesium, two-component, two-cycle liquid metal MHD generator. Author

N70-29755# Illinois Univ., Urbana.

MECHANICAL AND THERMAL PHENOMENA IN SOLIDS Final Report

Charles Wert 15 Jan. 1970 11 p refs
(Grant AF-AFOSR-1461-68)

(AD-702535; AFOS7-70-0229TR) Avail: CFSTI CSCL 11/6

Briefly mentioned is research in four problems: (1) The electronic and magnetic properties of liquid metals containing transition metal paramagnetic ions has been deduced. Both localized and distributed moments were seen and a regular pattern was apparent. A theory has been developed to interpret the phenomena. (2) Precipitation and clustering of interstitial gas atoms in refractory metals has been studied using both internal friction and electron microscopy. (3) Diffusion of hydrogen in bcc metals has been investigated using the Snoek peak. Formation of hydrides in Nb and V has been correlated with studies of phase diagrams. (4) An investigation of anomalous self- and substitutional diffusion has been concluded. Author (TAB)

N70-29818# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ACADEMY OF SCIENCES OF THE UKRAINIAN SSR. INSTITUTE OF STABILITY PROBLEMS. HEAT RESISTANCE OF MATERIALS AND STRUCTURAL ELEMENTS: SELECTED ARTICLES [AN UKRSSR. INSTITUT PROBLEM PROCHNOSTI. TERMOPROCHNOST' MATERIALOV I KONSTRUKTIVNYKH ELEMENTOV]

V. N. Filipenko et al 2 Oct. 1968 29 p refs Transl. into ENGLISH from Tr. Vses. Nauch.-Tekhn. Soveshch. po Vopr. Prochnosti Materialov i Konstrukt. Elementov Pri Vysokikh Temperaturakh, 4th (Kiev), 1967 16 p

(AD-684692; FTD-HT-23-817-68) Avail: CFSTI CSCL 11/6

Contents: Thermal fatigue in rigidly attached specimens of EI435, EI703, and EI835 sheet materials; The effect of operating conditions on the efficiency of turbine blades for aircraft gas turbine engines; Investigation of zirconium dioxide erosion in a high-temperature gas flow of combustion products. TAB

N70-29860# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Metallurgy and Materials Science.

INTERGRANULAR FRACTURE IN AN A1-15 WT. PERCENT ZN ALLOY Final Technical Report

William J. Kovacs and J. R. Low, Jr. Feb. 1970 239 p refs
(Contract Nonr-760(31); ARPA Order 878)
(AD-702693) Avail: CFSTI CSCL 11/6

Cracking kinetics involved in the intergranular fracture of an A1-15wt% Zn alloy tested in air, distilled H_2O, and 0.5M NaCl have been studied by means of the elastic strain energy released during crack propagation in a double cantilever beam specimen. This technique has been applied to two different types of specimens: polycrystals with equi-axed grains and bi-crystals with crack propagation confined to the grain boundary. By varying the microstructure through selective aging treatments, a wide range of cracking susceptibility has been observed. The results show that the fracture toughness of this alloy increases with a decreasing volume fraction of G. P. zones in the matrix. A similar trend in the stress-corrosion cracking tests in 0.5M NaCl is noted, and the susceptibility to fracture increases as the volume fraction of G.P. zones in the matrix increases. The microstructure highly susceptible to fracture exhibits planar slip traces while the more resistant microstructures show a dispersed type surface slip pattern. The dependence of cracking rates on the microstructure is explained in terms of inhomogeneous plastic flow in the matrix being blocked by grain boundaries and leading to severe stress concentrations at the boundaries. The bi-crystal tests substantiate these results and show that orientations favoring partial continuity of slip bands across grain boundaries are less susceptible to stress corrosion cracking than arbitrarily oriented boundaries with no slip continuity. Author (TAB)

N70-29869# Aeronautical Research Labs., Melbourne (Australia).

EDDY CURRENT TESTING OF THE FLAT SLAB

I. G. Scott Oct. 1969 45 p refs
(ARL/Met-78) Avail: CFSTI

Calculations were made of the effects of specimen conductivity, test frequency and coil-to-specimen spacing on indicated eddy current test results, using analytical expressions. Author

N70-29894# Nukleami Institut Jozef Stefan Ljubljana (Yugoslavia).

THE INFLUENCE OF Bi_2O_3 ADDITIONS ON THE SINTERING AND THE MAGNETIC PROPERTIES OF STRONTIUM FERRITE

D. Kolar and M. Drofenik Dec. 1969 18 p refs
(IJS-R-573) Avail: CFSTI

Bismuth oxide is very beneficial in raising the coercivity of strontium ferrite magnets. The addition of Bi_2O_3 influences the temperature at which the sintering starts and the temperature at which the maximum density may be obtained, probably due to the formation of liquid phase during the sintering. Microprobe analysis shows the presence of a Bi_2O_3-rich grain boundary phase with the composition 30 to 32 % Bi_2O_3, 18 to 20 % SrO, and 49 to 50 % Bi_2O_3. Grain growth is primarily controlled by the residual porosity and is not particularly sensitive to the Bi_2O_3 additions. Author

N70-29902# Advisory Group for Aerospace Research and Development, Paris (France).

THE INFLUENCE OF FRETTING ON FATIGUE

W. J. Harris (Rolls-Royce, Ltd., Watford, Engl.) Mar. 1970 15 p refs Presented at the 28th Meeting of AGARD Structs. and Maters. Panel, Dayton, Ohio, Apr. 1969
(AGARD-AR-21) Avail: CFSTI

A recapitulation of the characteristics of the fretting fatigue phenomenon described with a re-appraisal of the theory of the basic mechanism in the light of recent research, tend to confirm: (1) the significance of the residual tensile stress field remanent after plastic compression of the asperities; (2) the analysis of the fatigue results indicating that the sensitivity of fretting fatigue to the contact pressure is similar to the 'notch sensitivity' of the material; (3) by microscopical studies, the nucleation of fretting fatigue cracks near the plastic zones surrounding the scars and their propagation along 45 deg planes rather than normal to the fatigue stress axis; and (4) that the modest target of achieving anti-fret resistance up to 150 C (suitable for Mach 2.2 civil aircraft) can be met by the use of cured polymeric — MoS_2 films interposed between the contact faces. Author

N70-29955# Westinghouse Electric Corp., Pittsburgh, Pa. Nuclear Energy Systems.

HEAVY SECTION FRACTION TOUGHNESS PROPERTIES OF A533 GRADE B CLASS 1 STEEL PLATE AND SUBMERGED ARC WELDMENT

W. O. Shabbits W. H. Pryle, and E. T. Wessel Dec. 1969 65 p refs Prepared for Union Carbide Corp., Oak Ridge, Tenn.
(Contract W-7405-eng-26)
(WCAP-7414; TR-6) Avail: CFSTI

The fracture toughness tensile, and Charpy V-notch properties generated for A533 Grade B Class 1 steel plate and submerged arc weldment material are presented. Also the equipment, techniques, and interpretation procedures used to obtain results from compact tension specimens up to 12 inches thick are described. The results indicated that the fracture toughness properties were highly temperature dependent with a rapid increase in toughness between 0 F and room temperature, and that the weldment material is comparable or of higher toughness than the base plate material. In the temperature range of practical interest, these high levels of toughness provide assurance of a high degree of fracture safety in heavy section welded structures. Included is a brief background on linear elastic fracture mechanics and a discussion on the significance of the data as related to the practical usefulness, applicability, and overall potential of the linear-elastic (plane-strain) fracture mechanics approach to the design against fracture. Author

N70-30011# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CHARACTERISTICS OF RECRYSTALLIZATION OF NICKEL-BASE ALLOYS

B. B. Diomidov et al 25 Nov. 1969 9 p Transl. into ENGLISH from Sb. Tr. Vech. Met. Inst. (Moscow), no. 6, 1968 p 248–251
(AD-701035; FTD-HT-23-549-69) Avail: CFSTI CSCL 11/6

The paper presents data obtained during the study of the effect of excess phases in the EI435 and EI4375 alloys on the process of recrystallization. A relationship was established of the recrystallization kinetics with the presence of particles of excess phases. It was found that the separation of the intermetallic phase and carbides before deformation increases the rate of formation of recrystallization centers. The decrease of the difference in the grain size after recrystallization annealing may be achieved by the preliminary heat treatment with retarded cooling. Author (TAB)

N70-30023# IIT Research Inst., Chicago, Ill. Dept. of Metallurgical Engineering.

THE EFFECT OF LEAD ON MICRO-CRACK INITIATION AND PROPAGATION IN ALLOY STEELS. THE EFFECT OF COMPOSITION AND TEST CONDITIONS ON LEAD-EMBRITTLEMENT OF STEEL Final Report

William R. Warke and Norman N. Breyer Nov. 1969 151 p refs
(Contract DA-20-113-AMC-10820(T))
(AD-701047; TACOM-TR-10752) Avail: CFSTI CSCL 11/6

The effects of composition grain size, strain rate and other variables on the lead-embrittlement of steels were studied. The lead embrittlement of steel was observed as a loss in ductility and true fracture strength of heat treated steel tested at elevated temperatures in the presence of lead. The embrittlement was seen when the lead was present either internally in the steel (leaded steel) or soldered to the surface. The phenomenon was found to exist over a range of temperatures from about 300F (i.e. more than 300 F below the melting point of lead) to a brittle-to-ductile transition temperature which ranged from 700 F to over 900 F depending on a number of factors B. It was found that the embrittlement varied with composition and seemed, at an equivalent strength level, to be more severe the lower the carbon or alloy content of the steel. The lead content of a leaded steel was found to be unimportant, but the composition of the lead was critical. Other variables which were studied included grain size, loading rate, prior plastic straining at room temperature and cyclic loading. TAB

N70-30025# Midwest Research Inst., Kansas City, Mo.

ULTRASONIC REFLECTIVITY OF CORRODED SURFACES

Fred R. Rollins, Jr. 1969 13 p refs Presented at ASM WESTEC Conf., Los Angeles, 1969
(Contract N00014-67-C-0360)
(AD-701930; TR-4) Avail: CFSTI CSCL 11/6

Useful information about the physical properties of solid surfaces can often be obtained from a simple study of ultrasonic reflectivity versus angle of incidence. The paper briefly describes a reflection technique which facilitates rapid examination of metal surfaces and discusses application of the technique to the study of corrosion. Results from several types of oxidized and corroded surfaces are presented and interpreted in terms of the physical properties of substrate metal and corrosion products. Author (TAB)

N70-30036*# General Electric Co., Schenectady, N.Y.

CONTAMINATION OF REFRACTORY METALS BY OXYGEN, WATER VAPOR, AND CARBON MONOXIDE

M. D. Ketchum and C. A. Barrett (NASA. Lewis Res. Center) Washington NASA May 1970 129 p refs
(Contract NAS3-8518)
(NASA-CR-1537; S-69-1114) Avail: CFSTI CSCL 11F

The sticking probabilities were determined for oxygen, water vapor, and carbon monoxide on columbium 1% zirconium, pure tantalum and several combinations of tantalum alloyed with tungsten and hafnium. The investigation was made with the metals exposed to temperatures between 1156 and 1373 K and with gas pressure between approximately 10 to the minus 5th power and 10 to the minus 7th power torr. The specimen weight increase due to absorbed gas was calculated from the specimen gettering rate. The results closely agreed with the weight gains determined by gravemetric analysis and gas analysis. Author

N70-30040# Aeronautical Research Labs., Melbourne (Australia).

COTTRELL-STOKES RATIOS AND DISLOCATION DISTRIBUTIONS IN COPPER

F. P. Bullen and S. Mc K. Cousland Sep. 1969 18 p refs
(ARL/Met-68) Avail: CFSTI

The Cottrell-Stokes ratio in polycrystals remains sensibly constant at low and intermediate flow stresses; in single crystals deformed in simple tension it increases with flow stress, beyond stage. The C-S ratio/flow-stress relationship in single crystals, in which alien dislocation distributions were produced by twisting, by constrained tensile strain, or by change of glide plane after prestrain, is described. The C-S ratios of such crystals are independent of their initial flow stress (beyond the range of normal stage 1 values) and remain constant during further tensile strain; at intermediate flow stresses, the C-S ratios are greater than those for single crystals deformed in simple tension and approximately equal to those for deformed polycrystals. It is proposed that the common value for the alien distributions and polycrystals corresponds to an isotropic dislocation distribution, and that forest-rich anisotropic distributions approach isotropy more rapidly with increasing strain than those with excess primary dislocations. The difference in rate of approach is compatible with the different roles of primary and secondary dislocations in single-slip deformation and with the single-valued nature of the C-S ratio/flow-stress relationship for constrained tensile deformation of single crystals. Author

N70-30050# Aeronautical Research Labs., Melbourne (Australia).

THE EFFECTS OF PRESSURIZATION ON YIELDING OF A COPPER, 2.5 % INDIUM, 0.3 % LEAD ALLOY

M. M. Hutchison and R. T. Pascoe Nov. 1969 12 p refs
(ARL/Met-69) Avail: CFSTI

Dislocations are generated near lead particles in a copper 2.5% indium, 0.3% lead alloy by hydrostatic pressures greater than 2 kbar. The yield point at atmospheric pressure becomes smaller with increasing pressurization and no yielding discontinuity is evident above 6 kbar. Pressurization above 2 kbar also increases the flow stress subsequent to yielding; this increment rises with increasing pressure. The yield point in this alloy probably does not result from the destruction of short-range order because the yield point is removed by isolated clusters of dislocations in comparatively large regions of unyielded matrix. Author

N70-30064# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ELECTROCHEMICAL PROTECTION OF METALS FROM HIGH-INTENSITY CAVITATION EFFECTS

L. N. Lenkova et al 25 Sep. 1969 14 p refs Transl. into ENGLISH from Tsentr. Nauchn.-Issled. Inst. Morsk. Flota (Leningrad), no. 49, 1967 p 62–71
(AD-700294; FTD-HT-23-266-69) Avail: CFSTI CSCL 13/8

The minimum current density required to provide cathodic protection against high intensity cavitational sea water corrosion was determined for low-carbon steel St3, high-strength cast iron VCh-60-1.5, titanium alloy, stainless chrome-nickel steel Kh18N9, and brass LMtsZh-55-3-1. The experiments were carried out by using a magnetostriction vibrator; the vibration amplitude of the specimens was 95 and 45 microns; the vibrational frequency was 8000 hertz. The specimens were immersed either in artifically prepared sea water resembling that of the Black Sea or in fresh water with various concentrations of oxygen. The effect of four current densities was studied (10, 75, 400, and 800 amp/(sq m). Cathodic polarization curves of stationary and vibrating specimens were produced, and the potential of the specimens relative to that of a saturated calomel electrode was determined with a PPTV-1 potentiometer (for low-current densities) and with a VLU-2 voltmeter (for high-current densities). The weight loss of the metallic specimens after a 3-hr exposure to either sea water or fresh water was determined as a function of the applied cathodic current density. It was noted that cathodic polarization decreased the cavitational corrosion of metals, with the protective effect being greatest for the least corrosion-resistant metals. Author (TAB)

N70-30070# Aerojet-General Corp., Sacramento, Calif. Nuclear Div.

SUBCRITICAL CRACK GROWTH IN BERYLLIUM AT −320 F

A. T. Green, C. E. Hartbower, and P. P. Crimmins Oct. 1969 24 p refs Sponsored by AEC
(RN-S-523) Avail: CFSTI

Compact tension tests of vacuum-hot-pressed, S200-grade beryllium were conducted at −320 F. Instrumentation included piezoelectric accelerometers and electric resistance strain gages. The tests were conducted to evaluate the subcritical crack growth characteristics of S200−grade beryllium under plane strain conditions. The stress wave analysis technique revealed discontinuous crack growth at −320 F prior to the final plane strain instability. The crack toughness of the beryllium tested was the square root of 16.4 ksi-in. at −320 F. Author (NSA)

N70-30072# California Univ., Berkeley. Lawrence Radiation Lab.

MICROMECHANICS OF FRACTURE OF PEARLITIC STRUCTURAL STEELS

Peter J. Guest Dec. 1969 149 p refs
(Contract W-7405-eng-48)
(UCRL-19106) Avail: CFSTI

A mechanical and metallurgical analysis was carried out on the pearlitic, martensitic and spheroidized carbide structures of plain carbon hypoeutectoid steels in the temperature range 320 F to −150 F. The quantitative measurement of the microcharacteristics associated with cleavage fracture were determined by the use of the stress wave emission technique, which essentially monitors the elastic wave produced by discontinuous crack movements. The measured chemical properties were correlated with information obtained from optical and scanning electron microscopy techniques. The analysis shows that as the volume fraction of pearlite is increased from 0 to 1, the plane strain fracture toughness decreased by 65% at − 70 F and by 61% at 320 F. The data showed there to be a square root of d relationship between the plane strain fracture toughness and ferrite grain size. The micromechanical analysis showed that by increasing the volume fraction of pearlite from 0 to 1, the microcrack density increased by a factor of 8 to 100 F and by a factor of 9 at 320 F. Author

N70-30100# Los Alamos Scientific Lab., N. Mex.

EFFECTS OF NEUTRON RADIATION (OR RADIATION DAMAGE) ON NIOBIUM ALLOYS: A BIBLIOGRAPHY

Jean Furnish, comp. 18 Mar. 1970 14 p refs
(Contract W-7405-eng-36)
(LA-4387) Avail: CFSTI

Nuclear Science Abstracts, v. 22−23 (1968−69), was searched for information on effects of neutron radiation (or radiation damage) on niobium and its alloys. Entries are arranged in the order they appeared in Nuclear Science Abstracts. Author (NSA)

N70-30113*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SURVEY OF PROPERTIES OF T-111 (TANTALUM-8 TUNGSTEN-2 HAFNIUM)

Paul E. Moorhead and Phillip L. Stone Washington Jun. 1970 26 p refs
(NASA-TN-D-5873; E-5562) Avail: CFSTI CSCL 11F

A survey of available information concerning T-111 alloy is presented. This includes thermophysical properties, mechanical properties, melting and fabrication, welding, and resistance to alkali-metal corrosion. T-111 is shown to be a suitable engineering material for advanced space power systems. Author

N70-30115# Toronto Univ. (Ontario). Inst. for Aerospace Studies.

FATIGUE TESTS AND MICROSTRUCTURAL STUDIES OF OFHC COPPER FROM 25C TO 425C AT + OR 2 deg TORSION (WOOD'S F-RANGE)

R. M. Puccini Mar. 1970 60 p refs Sponsored by Natl. Res. Council of Can.
(UTIAS-142) Avail: CFSTI

An investigation was conducted into the effects of grain size and temperature on the torsion fatigue endurance of OFHC Copper at a constant low amplitude reversed strain. It was found in all cases that large grain size specimens have shorter fatigue lives than small grain samples when tested under identical conditions. As the test temperature was increased from 25 C for fixed + or 2 deg torsion, the endurance decreased uniformly and rapidly for both grain sizes up to 200 C. From 350 C to 425 C, again the fatigue life fell off at a fast rate. However, in the intermediate range (200 deg to 350 deg) the large grain size specimens show a much more gradual decrease in endurance than in the high and low temperature ranges and the small grain samples actually show a significant increase in mean life reaching a maximum at 275 C. Microstructurally, Wood's F-type damage is observed at room temperature with notch-peaking slip band formation and thin transgranular cracks in all directions being prevalent. At high temperatures the fatigue mechanism involved the formation of an elongated grain structure and wide cracks in the grain boundaries travelling perpendicular to the torsion axis. Grain boundary migration and surface oxidation were also important factors. In the intermediate temperature range, evidence of both mechanisms is found and in general, damage in the small grain specimens is more diffuse than the large grain samples. Author

N70-30126# Royal Aircraft Establishment, Farnborough (England).

THE FATIGUE PROPERTIES OF TITANIUM AND TITANIUM ALLOYS. PART 1: THE FATIGUE STRENGTH AT LOW AND HIGH TEMPERATURES [UEBER DAS DAUERSCHWINGVERHALTEN VON TITAN UND SEINEN LEGIERUNGEN. 1: DAUERSCHWINGFESTIGKEIT BEI TIEFEN UND HOHEN TEMPERATUREN]

M. Hempel Jan. 1970 52 p refs Transl. into ENGLISH from Draht (Coburg), v. 15, no. 8, 1964 p 502 514
(RAE-Lib-Trans-1400) Avail: CFSTI

A brief review is given of the fatigue properties of commercial purity titanium, some commercial and some noncommercial titanium alloys at low and high temperatures. At low temperatures (+20 deg to 196 C) the fatigue strength increases with decreasing temperature for notched and unnotched test pieces. The increase in fatigue strength is marginally less than the increase in tensile strength. For high temperatures (+20 to −550 C) the fatigue strength of notched and unnotched test pieces decreases with increasing temperature. Although greater scatter occurred in the results, the scatter depended on the type of alloy, test frequency and number of cycles to failure. The scatter in the values of the stress concentration and notch effect factors are very much greater at high temperatures. The effect of fatigue-creep interactions at high temperatures is also discussed. Author

N70-30167# Army Materials and Mechanics Research Center, Watertown, Mass.

TEXTURING IN AN AGE-HARDENED Ti-6 Al-4V

Anthone Zarkades and Frank R. Larson Dec. 1969 16 p refs
(AD-701905; AMMRC-TR-69-32) Avail: CFSTI CSCL 11/6

A sheet of textured titanium alloy Ti-6Al-4V was examined after various solution treatments to ascertain the effect of heat treatment upon texturing, microstructure, and mechanical properties. Specimens were solution treated between 1400 and 1800 F for 1/4 hour, water quenched, then aged at 1000 F for four hours and air cooled. Examination revealed that the texture-strengthening characteristics evident in the as-received condition did not increase in the treated materials and at 1800 F all indications revealed complete removal of the texture inherent in the starting material. However, an increase in the uniaxial strength level with little or no loss of (R) texture strengthening was observed in material treated between 1400 and 1700 F. Plots of the mechanical properties obtained versus solution temperature and corresponding photomicrographs of each material condition are illustrated along with the corresponding (0002) pole figures. The resultant mechanical properties are compared and analyzed with the corresponding microstructures and textures. Author (TAB)

N70-30168# TRW Equipment Labs., Cleveland, Ohio. Materials Technology Lab.

LITERATURE SURVEY ON THE INFLUENCE OF ALLOYING ELEMENTS ON THE FRACTURE TOUGHNESS OF HIGH ALLOY STEELS Interim Technical Report, 13 Mar. – 13 Jul. 1969

C. Vishnevsky Feb. 1970 85 p refs
(Contract DAAG46-69-C-0060)
(AD-701908; ER-7384; AMMRC-CR-69-18/1) Avail: CFSTI CSCL 11/6

A literature survey was conducted on the effects of alloying elements on the toughness of various high alloy steels. Included in this survey were 12 and 18%Ni maraging grades, 9Ni-4Co steels, 5-9%Ni age hardening steels, 130/150 and 180/210 ksi yield strength submarine hull steels and various intermediate experimental steel types. Brief consideration was also given to some lower alloy compositions. The results of the survey indicated that nickel provides the most consistent benefits to toughness. With few exceptions carbon, silicon, and manganese are highly undesirable alloy additions. Tramp impurities such as phosphorus and sulfur are detrimental and large improvements in toughness are observed when these elements are reduced to extremely low levels (.002%). Cobalt performs multiple functions and is most desirable in steels containing 9% or more nickel. The carbide formers, chromium, and molybdenum behave in an interdependent fashion which varies with steel type. The most consistent benefit these elements (as well as other carbide dormers) have on toughness is in providing secondary hardening at high tempering temperatures. The use of low carbon or alloy martensites causes the most significant improvements in toughness of high alloy steels. Large increases in strength with minimal loss in toughness are possible with microstructural control by thermal or thermomechanical processing. Austenite grain refinement by thermal cycling is a particularly attractive process for obtaining a high strength-toughness balance in many steels. Author (TAB)

N70-30172# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Metallurgy and Materials Science.

THE EFFECT OF MICROSTRUCTURE ON THE STRESS-CORROSION SUSCEPTIBILITY OF AN AL-ZN-MG ALLOY

A. J. De Ardo, Jr. and R. D. Townsend Feb. 1970 133 p refs
(Contract Nonr-760(31); ARPA Order 878)
(AD-702691) Avail: CFSTI CSCL 11/6

The effect of microstructure on the susceptibility of a high purity Al-6.8% Zn-2.3% Mg alloy to stress-corrosion cracking in an aqueous salt solution (3.5 wt % NaCl) was studied. The results of testing a series of specimens having controlled microstructures and the same yield strength of 40,000 psi indicate that the susceptibility to stress-corrosion is controlled by the type, size, and spacing of the matrix precipitate through the effect of these precipitates on the deformation process. Although the width of the precipitate free zone appears to have no effect on susceptibility, the grain boundary precipitate seems to influence susceptibility in certain cases. Supporting evidence for these observations was obtained by light and electron microscopic examinations of deformed specimens and by fractographic studies. A model is proposed which explains many experimental observations. Author (TAB)

N70-30173# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Metallurgy and Materials Science.

THE EFFECT OF TRACE IMPURITIES ON THE STRESS-CORROSION CRACKING SUSCEPTIBILITY AND FRACTURE TOUGHNESS OF 18 Ni 300 GRADE MARAGING STEEL Final Technical Report

R. P. M. Procter and H. W. Paxton Jan. 1970 49 p refs
(Contract Nonr-760(31); ARPA Order 878)
(AD-702692) Avail: CFSTI CSCL 11/6

A series of 18 Ni (300 grade) maraging steels of overall commercial purity but containing also deliberate impurity additions of sulphur, phosphorus, carbon, chromium and silicon plus manganese was studied. The fracture toughness and stress-corrosion resistance (determined using plane-strain fatigue-precracked specimens tested in 3.5% sodium chloride solution) of these steels was compared to the fracture toughness and stress-corrosion resistance of a commercial purity 18 Ni (300 grade) maraging steel with no deliberate impurity additions, and to a similar steel prepared from special high-purity melting stock. The most important conclusions reached are that: (i) Ultra-high purity steels do not have significantly improved stress-corrosion resistance, but show useful increases in fracture toughness when the carbon content is less than 0.005%; (ii) Simultaneous additions of Mn plus Si result in extremely low fracture toughness values; (iii) High carbon contents (greater than 0.03%) result in marginally improved stress-corrosion resistance; (iv) High Cr contents result in rather poor stress-corrosion properties. These results were correlated with the electron transmission microstructure of the steels and the results of a fractographic analysis of the fracture surfaces. Author (TAB)

N70-30202*# Boeing Co., Seattle, Wash. Aerospace Group.

CHARACTERIZATION OF POROUS METAL MATRICES FOR TRANSPIRATION COOLED STRUCTURES Interim Report

R. E. Regan Jun. 1970 34 p refs
(Contract NAS3-12012)
(NASA-CR-72699) Avail: CFSTI CSCL 11F

Porous metal parts produced by two methods, sintered powder and compressed and sintered wire cloth, were characterized so as to assure their suitability for being used in transpiration cooling experimentation. The methods of characterization included a chemical analysis and an analysis of microstructure and porosimetry data. A description of the characterization methods used is included and the resultant data (porosity, mean hydraulic pore diameter and degree of interconnected porosity) reported. Author

N70-30246# Florida Univ., Gainesville. Dept. of Metallurgical and Materials Engineering.

AN INVESTIGATION OF THE RELATION OF DYNAMIC

STRAIN AGING TO FLOW STRESS COMPONENTS IN TITANIUM AND ZIRCONIUM Progress Report

13 Feb. 1970 32 p refs
(Contract AT(40-1)-3262)
(ORO-3262-15) Avail: CFSTI

Preliminary results of tensile tests on Ti and Zr conducted over wide ranges of temperatures and strain rates are reported. Parameters of hardening are being used in calculations which are coefficients representing the difference in flow stress between two specific strain intervals. Data on elongation versus temperature are included for Ti and Zr. Results of research are also included on theory of strain relaxation of constant stress, tensile deformation of Zr at 77 K, ductility and camping capacity of Zr, creep of Zircaloy-2, and twinning and slip modes of monocrystalline and polycrystalline Zr. NSA

N70-30250# Linfield Research Inst., McMinnville, Oreg.

STUDIES OF METAL SURFACES BY FIELD EMISSION MICROSCOPY AND APPLICATIONS Final Report, 1 May 1957 – 30 Apr. 1961

R. W. Strayer, J. K. Trolan, L. C. Crouser, and F. M. Charbonnier
30 Apr. 1969 99 p refs
(Contract Nonr-2341(00))
(AD-702782) Avail: CFSTI CSCL 11/6

Field emission techniques were applied to the investigation of clean metal surfaces. In particular, the pulsed field emission microscope was used to study (1) surface migration of metal atoms over their own substrate, (2) screw dislocations, and (3) changes in emitter shape due to simultaneous application of high temperature and high electric field. Also the field ion microscope was used to investigate the atomic detail of a metal surface. Possible application of field emission to useful electronic devices was investigated in two areas: (1) the development of low voltage tubes using field emission cathodes, and (2) stabilization of field emission cathodes by high current density. Author (TAB)

N70-30260# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PHYSICS OF METALS AND METAL SCIENCE: SELECTED ARTICLES

M. G. Lozinskii et al 15 Aug. 1968 20 p refs Transl. into ENGLISH from Fiz. Metal. i Metalloved. (USSR), v. 23, no. 2, 1967 7 p
(AD-685516; FTD-HT-23-366-68) Avail: CFSTI CSCL 11/6

Contents: Effect of temperature and degree of deformation in thermomechanical working of nickel on its heat resistance; and Changes in the structure and substructure of deformed molybdenum on heating. TAB

N70-30279# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PROPERTIES AND APPLICATION OF HEAT-RESISTANT ALLOYS: SELECTED ARTICLES

D. I. Prokofev et al 3 Sep. 1969 18 p refs Transl. into ENGLISH from Akad. Nauk SSSR Inst. Met. (Moscow), 1966 6 p
(AD-700292; FTD-HT-23-272-68) Avail: CFSTI CSCL 11/6

Contents: Physiocochemical investigation of the alloys in the system niobium-tungsten-molybdenum-chromium; and Economically alloyed heat-resistant (nickel base) alloys EP404 and EP454. TAB

N70-30307# Naval Research Lab., Washington, D.C.

TRENDS IN CHARPY V SHELF ENERGY DEGRADATION AND YIELD STRENGTH INCREASE OF NEUTRON-EMBRITTLED PRESSURE VESSEL STEELS

J. Russell Hawthorne 21 Oct. 1969 28 p refs
(Contract AT(49-5)-2110)
(NRL-7011) Avail: CFSTI

The effects of neutron irradiation on Charpy-V shelf energy and yield strength have been examined for three pressure vessel steel compositions: A302-B, A533, and A543. The effects of radiation exposure at 149 C and at 288 C to 393 C on the overall notch ductility are documented and compared. Summary plots showing the simultaneous degradation in shelf energy and the increase of yield strength levels broadly illustrate the progressive change from ductile fracture performance to relatively brittle characteristics. The data for all three steel types suggest a common pattern of properties behavior. A three-stage change of shelf level versus yield strength is indicated with progressive neutron exposure at 149 C. Data patterns for strong (longitudinal) versus weak (transverse) test orientations of thick section plate imply strong trend similarities. Properties modified by progressive radiation exposure at 288 C are interpreted as following the same damage path described by 149 C irradiation. Author (NSA)

N70-30335# Oak Ridge National Lab., Tenn.

HEAVY-SECTION STEEL TECHNOLOGY PROGRAM Semiannual Progress Report, Period Ending 31 Aug. 1969

Mar. 1970 122 p refs
(Contract W-7405-eng-26)
(ORNL-4512) Avail: CFSTI

Results of research and development on pressure vessel steel are reported. Development of programs to investigage complex stress states along with evaluation of data of proof testing, planning and conducting pressure vessel tests, and safety problems are described. Other aspects of the program concern the investigation of irradiated and unirradiated materials with methods for predicting failure in large water reactor pressure vessels. J.M.C.

N70-30346# Explosives Research and Development Establishment, Waltham Abbey (England).

THE REINFORCEMENT OF ALUMINUM WITH SILICON NITRIDE WHISKERS

J. C. Cannell 7 Aug. 1968 39 p refs
(ERDE-16/R/68; WAC/189/016) Copyright. Avail: CFSTI

Silicon nitride whiskers were found to be chemically compatible with aluminum at all temperatures below the melting point of the latter, but rapidly reacted and vanished at temperatures above this. Fine flake aluminum powder was the first matrix material used to incorporate the whiskers. The basic method consisted of hot pressing a uniformly mixed metal powder-whisker composition until sintering and compaction had occurred. Specimens of up to 20% by volume of whiskers were made but were rather brittle and could not be made completely free of voids. Various whisker orientation processes were tried to improve packing and consolidation of the compacts and obtain extra directional reinforcement. The second matrix material investigated was sintered aluminum powder. The mechanical properties of the extruded whisker-metal bar made from this type of metal powder were more acceptable from the standpoint of tensile strength. This extrusion in situ technique, or a modification of it, is felt to offer some promise for fabrication of whisker-metal composites. Author

N70-30390 National Lending Library for Science and Technology, Boston Spa (England).

COAGULATION OF DISPERSE PHASES IN Al-Cu, Al-Mg and Cd-Sb ALLOYS [KOAGULATSIYA DISPERSNYKH FEZ V SPLAVAKH SISTEM Al-Cu, Al-Mg I Cd-Sb]

K. A. Dobryden et al Feb. 1970 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Tsvet. Met. (Dzaudzhikau), no. 6, 1966 p 121–126
(NLL-RTS-5562) Avail: Natl. Lending Library, Boston Spa, Engl.: 17s 6d or 2 NLL photocopy coupons

The experimental procedure was originally devised to study Fe-C alloys. The first stage is to prepare alloy specimens with the disperse phase uniformly distributed by volume. After each isothermal soak the specimens are quenched in water to suppress the precipitation of further particles from solid solution. The particle counts and disperse phase contents per unit volume are used to calculate the average particle radii. The variation in particle counts between 3 to 4 different areas in the same specimen never exceeded 7% and the relative error in the average particle size determinations amounted to 10 to 12%. Author

N70-30402# General Electric Co., Schenectady, N.Y. Research and Development Center.

ROLE OF RARE EARTH ADDITIONS IN THE PHENOMENON OF HOT CORROSION Final Report, 1 Feb. 1968 – 31 Jan. 1970

Alan U. Seybolt Dec. 1969 21 p refs
(Contract N00014-68-C-0362)
(AD-700948; S-70-1001) Avail: CFSTI CSCL 11/6

The severity of attack in the hot corrosion of nickel-base superalloys is greatly reduced in alloys containing a dispersoid of CeO_2 or La_2O_3. These oxides interact with the sulfur entering the alloy from Na_2SO_4 decomposition, by forming an oxysulfide of the type M_2O_2S. In this way less Ni_3S_2 is formed, and hence less catastrophic oxidation. Author (TAB)

N70-30427# Technische Hochschule Munchen (West Germany).

THE MAGNETIC RESISTANCE OF NEAR-FERROMAGNETIC Pd-Ni ALLOYS [MAGNETO-WIDERSTAND FAST FERROMAGNETISCHER LEGIERUNGEN: PD-NI]

Hermann Schulz (Ph.D. Thesis) 1970 58 p refs In GERMAN; ENGLISH summary
Avail: CFSTI

Low temperature electrical and thermal resistivities of the dilute Pd - Ni alloy in an external static magnetic field are studied. Corresponding to Doniach's field dependent local magnetization dynamic susceptibilities are given including local and host enhancement. It results that the local spinfluctuation contributions to the resistivities are strongly damped by the field. The thermal conductivity of pure Pd only shows corrections due to the d-electron spin wave and the field-deformation of the transversal spectral function. In addition a transversal directed magnetic field the s-electron winding by the Lorentz-force should cause to about 10%. Author

N70-30481# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

TRANSACTIONS OF THE LENINGRAD POLYTECHNIC INSTITUTE, NO. 295: SELECTED ARTICLES

A. V. Guts et al 21 Jan. 1970 22 p refs Transl. into ENGLISH from Politekhnicheskii Inst., Leningrad. Trudy (USSR), no. 295, 1968 p 90–107
(AD-703012; FTD-HT-23-317-69) Avail: CFSTI CSCL 11/6

Contents: Oxidation resistance of nickel-based alloys; Influence of conditions of melting and pouring the alloy EI607 AL on the properties of cast turbine blades. TAB

N70-30518# Aeronautical Research Labs., Melbourne (Australia).

PRESSURIZATION EFFECTS IN CHROMIUM

A. Ball and F. P. Bullen Nov. 1969 19 p refs
(ARL/Met-79) Avail: CFSTI

Microstructural changes resulting from pressurization treatments have been studied using transmission electron microscopy and an etch-pit technique; details of the etch-pit technique are given. Free dislocations are produced at Cr_2O_3 particles in the chromium matrix due to the difference in compressibilities. Diffraction contrast analysis shows that the dislocation loops are prismatic and of vacancy type; their number is in reasonable agreement with strain calculations using compressibility data. The effect of pressurization on the tensile load/elongation curves for single crystals has been determined. The magnitude of the yield drop is decreased and the hardening rate for single-slip orientations is increased showing that the numerous pressure-induced dislocation sources lead to multiple slip from the onset of plastic flow. Etch-pit studies of the effects of various repeated pressurization and pressurization-ageing cycles correlate with changes in tensile characteristics. Author

N70-30539# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

METHOD OF ALLOYING LIGHT ALLOYS WITH NITROGEN

K. M. Pogodina-Alekseeva et al 10 Dec. 1969 4 p Transl. into ENGLISH from Russian Patent No. 208273 (Appl. no. 1070071/22-2, 7 Apr. 1966) 1 p
(AD-702984; FTD-HT-23-550-69) Avail: CFSTI CSCL 11/6

The invention involves a method of alloying light alloys with nitrogen, added in the chemically bonded state (1-10 percent N added as aluminum hexachloroammoniate). Improvement in mechanical properties is indicated, but no quantitative data given. Author (TAB)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N70-29208# Oak Ridge National Lab., Tenn.

A VISCOELASTIC REPRESENTATION OF THE MECHANICAL BEHAVIOR OF RVD GRAPHITE AT ELEVATED TEMPERATURES

C. E. Pugh Feb. 1970 33 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2812) Avail: CFSTI

A set of constitutive equations is developed to describe the time-dependent mechanical behavior of RVD graphite at temperatures ranging from 3500 to 5000 F. The relations are based upon a transversely isotropic linear viscoelastic model with temperature-dependent parameters. This model is shown to be applicable for stress levels up to one-half the nominal ultimate stress values for the material and is expressed quantitatively through the use of experimental results. Predictions of these equations are compared with other experimental measurements including those from short-time stress-strain tests, creep tests, and relaxation tests. Author (NSA)

N70-29256 Yale Univ., New Haven, Conn.

CONSTITUTIVE EQUATIONS FOR ARTIFICIAL GRAPHITE

William Lavon Greenstreet (Ph.D. Thesis) 1968 225 p
Avail: Univ. Microfilms: HC $10.15/Microfilm $3.00 Order No. 69-8359

A small-deformation elastic-plastic continuum theory for the description of artificial graphite behavior at room temperature is derived. Artificial graphite, in this case, designates a family of materials which are made from petroleum-coke and coal-tar pitch and may be either molded or extruded. These materials exhibit essentially time independent elastic-plastic behavior at room temperature; they are anisotropic, and they undergo permanent volume change when tested in simple tension or compression. The continuum description developed is based on generalizations, to combined states of stress, of observations from uniaxial test results, these observations being typical for the entire family considered. Constitutive equations based on two variations of the plastic potential formulation are given. The first corresponds to uniformly expanding loading surfaces in stress space (isotropic hardening), while the second describes surfaces undergoing both translation and growth. The former leads to simpler expressions for the stress-strain relations, but the second provides a more physically realistic description of loading surface behavior. Dissert. Abstr.

N70-29272# Pennsylvania State Univ., University Park. Materials Research Lab.

NONLINEAR ELASTIC AND THERMOELASTIC PROPERTIES OF HIGH-TEMPERATURE MATERIALS Annual Progress Report

G. R. Barsch Dec. 1969 6 p
(Contract AT(30-1)-3991)
(NYO-3991-5) Avail: CFSTI

Results of investigations are reported on the nonlinearity of interatomic forces with respect to atomic displacements in high temperature materials such as uranium oxides and alkali halides. Work completed during the period includes compilation of elastic constants of silica, NaI, KI, RbCl, RbBr, and RbI. NSA

N70-29276# Battelle Memorial Inst., Columbus, Ohio.

FISSION-PRODUCT DEPOSITION AND ITS ENHANCEMENT UNDER REACTOR ACCIDENT CONDITIONS: DEVELOPMENT OF REACTIVE COATINGS Final Report

Harvey S. Rosenberg, George E. Cremeans, Joseph M. Genco, David A. Berry, and David L. Morrison Nov. 1969 61 p refs
(Contract W-7405-eng-92)
(BMI-1874; EURAEC-2133) Avail: CFSTI

Various amine containing polymers were studied in steam-air environments at elevated temperatures using dilute quantities of I-131 tagged iodine. Both noncondensing and condensing steam conditions were investigated. Several of the polymers showed sorption rates and capacities that would be adequate for the chemical removal of accident released fission product iodine and were several times more effective than commercial protective coatings currently being used. Some of the polymers also showed excellent resistance to loss of coolant accident environmental conditions on steel and concrete substrates. The coating was subjected to two large scale proof tests and yielded half lives of 1 and 16 min for the airborne I_2 and CH_3I concentrations, respectively, and maintained its integrity during the experiments. The use of a reactive coating as a passive safety system should appreciably reduce the airborne iodine half life and the hazards associated with iodine release during a nuclear reactor accident. Author (NSA)

N70-29470# National Bureau of Standards, Washington, D.C.

FAILURE OF GLASS UNDER BIAXIAL LOADING Technical Report, Jan. - Dec. 1969

S. M. Wiederhorn and H. Johnson Dec. 1969 26 p refs
(NAonr-7-70)
(AD-700332; NBS-10145) Avail: CFSTI CSCL 11/2

The paper presents results on the fracture of glass at pressures up to 10 Kb (150,000 psi). Fracture mechanics techniques were used to collect experimental data and results are expressed in terms of fracture surface energies. The fracture surface energies were observed to be independent of pressure for the three compositions studied. The results suggest that no change occurs in the mechanism of fracture at elevated pressures. Author (TAB)

N70-29475*# Massachusetts Inst. of Tech., Cambridge. Acoustics and Vibration Lab.

DYNAMIC PROPERTIES OF MODELLING CLAY

Stephen H. Crandall, Leonard G. Kurzweil, Anant K. Nigam, and Paul J. Remington 6 Feb. 1970 107 p refs
(Grant NGR-22-009-135)
(NASA-CR-66953; TR-76205-3) Avail: CFSTI CSCL 11G

A number of dynamic characteristics of plasticine have been measured for small strain simple harmonic oscillations in the frequency range 100 - 3000 Hz. In general the dynamic behavior of this material can be described by a simple linear isotropic viscoelastic model with complex moduli E and G where the values of E and G depend not only on frequency and temperature but also (due to thixotropy) on the prior history of large-strain deformation. Experimental limits on strain amplitude for validity of the linear model are given. Propagation velocities and loss factors for longitudinal waves in thin rods, plane dilational waves and simple shear waves are displayed. Poisson's ratio was determined by measuring both shear and dilational propagation velocities in the same specimen in a special sandwich configuration which permitted rapid changeover without introducing large strains. Author

N70-29543 National Lending Library for Science and Technology, Boston Spa (England).

ON THE WORLD'S HELIUM SUPPLY AND THE PROBABLE DEMAND BY HELIUM COOLED POWER REACTORS

J. Christensen 1970 19 p refs Transl. into ENGLISH from Brennst.-Waerme-Kraft (West Ger.), v. 21, no. 10, 1969 p 532-537
(NLL-RISLEY-Trans-1899-19091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The extent to which supplies and stocks of helium will meet present and future needs is assessed. Technical considerations and pricing policies are discussed. It is concluded that the possibility of a helium shortage as early as the turn of the century is likely. Author

N70-29590# California Univ., Livermore. Lawrence Radiation Lab.

LIGHT ARMOR PROGRAM Progress Report

M. L. Wilkins, C. F. Cline, and C. A. Honodel 4 Jun. 1969 62 p refs
(UCRL-50694; PR-4) Avail: CFSTI

The sequence of events that occurs when a sharp steel projectile strikes ceramic armor is examined using computer calculations in conjunction with experiments. Important physical properties of target materials that defeat penetration are identified. Experiments and calculations verify that the ballistic limit is very sensitive to the ceramic's tensile properties. The high stress load transmitted through the ceramic to a backup plate results in the backup plate yielding directly under impact. Introduction of ductility into a ceramic promises to improve armor facing material. Fabrication of ceramics with ductility is discussed. Experimental equation-of-state data were obtained for many current armor materials as well as for new armor material candidates. Author

N70-29593*# Battelle Memorial Inst., Columbus, Ohio.

INVESTIGATIONS OF THE POTENTIAL PERFORMANCE CHARACTERISTICS OF SELECTED CONTACT LUBRICANTS FOR APPLICATIONS IN MINIATURE SLIP-RING CAPSULES OF THE TYPE USED IN ST 124 M STABILIZED INERTIAL GUIDANCE PLATFORMS Final Technical Report, 27 Mar. 1968 - 30 Apr. 1970

J. B. Baker, G. B. Gaines, and K. E. Meiners 30 Apr. 1970 65 p
(Contract NAS8-21323)
(NASA-CR-102718) Avail: CFSTI CSCL 11H

Selective evaluation was carried out on miniature slip-ring capsules DP 1501 and DP 1506 that were remanufactured to include a proposed liquid lubricant of 75% OS 124 and 25% MCS 210 on the contacts. The feasibility of using solid-state lubricants on the contacts of miniature slip-ring capsules is discussed. The results show that the electrical performance of contacts in actual slip-ring capsules lubricated by the proposed substance does not differ significantly from the behavior of simulated contacts that were used in an earlier program. Low noise levels and low wear rates are achieved with contacts lubricated with the proposed materials. Composite bodies composed of MoS_2 dispersed in a gold or gold-alloy matrix can function as one member of a contact pair in actual slip-ring capsules. Techniques were developed for fabricating homogeneous bodies with continuous current paths throughout and with no large inclusions of the dispersed solid lubricant. Author

N70-29674# Los Alamos Scientific Lab., N.Mex.
CMF-13 RESEARCH ON CARBON AND GRAPHITE Summary of Progress, 1 Aug. – 31 Oct. 1969
Morton C. Smith 18 Dec. 1969 31 p refs
(Contract W-7405-eng-36)
(LA-4333; Rept-11) Avail: CFSTI

Research on Santa Maria coke directed toward grinding, molding, and extrusion of this material is reported. Information is included on internal structure, heat treatment effects on crystal parameters, particle size, densities, and effects of Thermax on Santa Maria fillers. Work is described on graphite extrusion, warm molding of resin-bonded fillers, and porosities of extruded graphites. Other work is reported on development of highly oriented polycrystalline graphite and on the effects of filler particle shape on graphite anisotropy factors. Research effort devoted to development of improved graphite binders is also reported. NSA

N70-29690# Los Alamos Scientific Lab., N.Mex.
EQUATION OF STATE OF LOW-DENSITY CARBON
R. G. Mc Queen and W. J. Carter 13 Mar. 1970 7 p
(Contract W-7405-eng-36)
(AD-702446; LA-4340) Avail: CFSTI CSCL 11/2

Preliminary experimental attempts to determine the low-pressure, high-temperature equation of state of carbon are reported. Shock waves are used to raise foamed carbon to very high energy densities, and analysis of the subsequent pressure release wave then yield P, V, E equation-of-state data in the desired region. Author (TAB)

N70-29703# Army Weapons Command, Rock Island, Ill. Research and Engineering Directorate.
POLYTHIOETHER URETHANE-UREA ELASTOMERS RESISTANT TO FUELS AND SERVICEABLE AT LOW TEMPERATURES
W. M. Veroeven Jan. 1970 16 p refs
(AD-702242; RE-70-124) Avail: CFSTI CSCL 11/10

Urethane-urea millable gums were prepared from polythioether diols or blends thereof with a tetrahydrofuran, ethylene oxide, allyl glycidyl ether terpolymer or a polyether containing epichlorohydrin. The presence of pendant unsaturation introduced by allyl glycidyl ether during diol preparation or glycerol allyl ether during gum preparation permitted these gums to be sulfur or peroxide cured. Although some vulcanizates of these elastomers exhibited good stress-strain properties, excellent oil and fuel resistance and fair low-temperature flexibility no one vulcanizate was able to meet all of these goals simultaneously. Zinc oxide markedly improved physical properties in sulfur-cured thioether vulcanizates. Hydroxy-polybutadiene resins were effective for introducing unsaturation into certain urethane-urea millable gums. Author (TAB)

N70-29736# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATION OF THE VAPOR PERMEABILITY OF THERMAL INSULATION MATERIALS
D. M. Dudnik 4 Oct. 1969 10 p ref Transl. into ENGLISH Kholodil. Tekh. i Tekhnol. (Ukr. SSR), no. 4, 1967 p 45–49
(AD-700795; FTD-HT-23-541-68) Avail: CFSTI CSCL 11/7

A detailed investigation was made to determine experimentally the vapor permeability of a number of plastic thermal insulators used in refrigeration technology. The vapor permeability was determined by measuring the average quantity of water vapor that penetrates a 1(sq m) area in one hour, through 1-m thickness, under a pressure of 1 Newton/(sq m). The corresponding permeability coefficient is mathematically defined. A total of 23 different materials was tested, and the results were tabulated. It is shown from these results that most foam plastics have good vapor-insulation characteristics. The most homogeneous among the various foam plastics tested were the hard-foam poly-urethanes. Author (TAB)

N70-29772# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD FOR INVESTIGATING ENERGY LOSSES IN DRY FRICTION JOINTS WITH ROTAPRINT (ROTARY) LUBRICATION
Yu. N. Drozdov et al 15 Oct. 1969 10 p ref Transl. into ENGLISH from the Publ. 'Nauchnye Printsipy i Novye Metody Ispytanii Materialov Dlya Uzlov Treniya' Moscow, Nauka, 1968 p 133–136
(AD-700363; FTD-HT-23-376-69) Avail: CFSTI CSCL 11/8

The problem of assuring the operating capability of friction joints in vacuo and at elevated temperatures is becoming increasingly important and, in this context, the use of solid lubricants and self-lubricating materials is highly promising. One of the methods for introducing solid lubricant to the working zone of the friction couple is the rotary or (rotaprint) method in which the working gear is in contact with a lubricating gear that does not transmit any work load but assures, in the course of its wear, the transfer of solid lubricant to the friction contacts of the gearings. TAB

N70-29853# Avco Government Products Group, Lowell, Mass. Avco Applied Technology Div.
EVALUATION OF TEST TECHNIQUES FOR ADVANCED COMPOSITE MATERIALS Technical Report, Jun. 1968 – Mar. 1969
E. M. Lenoe Dec. 1969 185 p refs
(Contract F33615-67-C-1719)
(AD-699586; AVATD-183-69-RR; AFML-TR-68-166-Pt-2) Avail: CFSTI CSCL 11/4

Tentative test methods are presented for evaluating the tension, compression, flexure, and shear behavior of boron epoxy composites. The report includes the results of fairly extensive studies of the influence of specimen geometry and experimental techniques. Limited information is also presented concerning the thermoelastic response of nominal 50 volume percent boron laminates. Comparisons are made of data obtained using sandwich beam experiments and coupon test specimens. Author (TAB)

N70-29886# Oak Ridge National Lab., Tenn. Reactor Div.
DETERMINATION OF RELATIVE THERMAL RUPTURE RESISTANCES OF GRAPHITE
G. T. Yahr (M.S. Thesis - Tennessee Univ., Knoxville) Jan. 1970 47 p refs
(Contract W-7405-eng-26)
(ORNL-4467) Avail: CFSTI

Polycrystalline graphite, which is used as a material for high-temperature application by the nuclear and aerospace industries, has remarkable resistance to thermal-stress-induced fracture. Nevertheless, certain applications tax its thermal rupture resistance, and selection of a particular grade of graphite for such an application must therefore include consideration of this property. Currently the type and grade of graphite are often selected on the basis of figures of merit that have evolved from elastic analyses since the thermal shock tests that have been developed are too expensive to be used as screening devices. This thermal shock test is rapid enough and sufficiently economical to be used for screening candidate materials for a particular application. The test consisted of heating thin disks of graphite at the center with an inert-gas shielded-arc nonconsumable electrode welder. Several disks of each graphite were heated, each at a different, but constant, power level. Author (NSA)

N70-29890# Naval Radiological Defense Lab., San Francisco, Calif.

A PROPOSED MODEL FOR THE DECOMPOSITION OF CELLULOSE AND THE EFFECT OF FLAME RETARDANTS Final Report

William J. Parker and Anne E. Lipska May 1969 58 p refs
(Contract DAHC20-67-C-0149)
(AD-701957) Avail: CFSTI CSCL 8/4

A simplified model for the decomposition of cellulose is presented along with the effects of flame retardants on this model. It is supported by several specific laboratory tests. The basic hypothesis is that above 275C cellulose decomposes through the simultaneous unzipping of all the cellulose molecules, thus accounting for the constant rate of decomposition over most of the pyrolysis period. There is only one controlling reaction, namely unzipping, not competing reactions as usually postulated. The rate of decomposition is proportional to the number of molecules present which is essentially constant over most of the decomposition period. The lengths of the molecules decrease linearly with time. After the oxygen links between the glucosan units are broken during the unzipping process, the units can either be transformed into levoglucosan or participate in the char-forming process with the release of H_2O, CO_2, and H_2. The other observed products of pyrolysis come from the decomposition of the levoglucosan. The action of the flame retardants is to increase the rate of decomposition and the amount of char produced. The rate is increased by increased by increasing the number of molecules through the breaking of inter-ring intramolecular bonds, or by increasing the unzipping rate through the breaking of intermolecular bonds. Direct action of the flame retardant on the levoglucosan causes the increase in char produced, and thus the reduction in flammability of the volatiles released. Author (TAB)

N70-29975# Addis Translations International, Woodside, Calif.

STUDY OF SPRAYING BORIDES AND NITRIDES BY PLASMA GUN. PART 2: CHARACTERISTICS OF THE SPECIMENS OBTAINED

G. Bentz, G. Provost, and C. Urban Oct. 1969 52 p refs Transl. into ENGLISH from Bull. Soc. Franc. Ceram. (Paris), no. 81, Oct.–Dec. 1968 p 23–43 Transl. for Calif. Univ., Berkeley. Lawrence Radiation Lab.
(PB-188142T; UCRL-Trans-10395) Avail: CFSTI CSCL 11B

Discussed are the refractory coatings resulting from the spraying of metal borides and nitrides by a plasma gun. The mechanical, physical, and structural properties of the following compounds are discussed: Chromium borides (CrB, CrB_2); Molybedenum borides (MoB, Mo_2B_5); Lanthanum boride (LiB_6); Titanium nitride (TiN); Zirconium nitride (ZrN); and Tantalum nitride (TaN). USGRDR

N70-29990*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NTWO: A NITROGEN PROPERTIES PACKAGE

K. J. Pew, R. C. Hendricks, and R. J. Simoneau [1970] 28 p refs Presented at Cryog. Eng. Conf., Boulder, Colo., 17-19 Jun. 1970; sponsored by NAS-NRC
(NASA-TM-X-52814) Avail: CFSTI CSCL 11G

A family of FORTRAN IV subroutines was developed to calculate the thermodynamic and transport properties of molecular nitrogen from the triple point to 300 K at pressures ranging from 0.1 to 200 atmospheres. The master subroutine NTWO calculates the remaining state variable when given any two of pressure, density, and temperature as input. In addition, any or all of the thermodynamic and transport properties - enthalpy, entropy, specific heats, sonic velocity, viscosity, thermal conductivity, surface tension - can be obtained by the state variable call or by a separate call. A call to NTWO with pressure and enthalpy will also generate all the other properties. The NTWO package was developed to be used in conjunction with heat transfer and fluid flow calculations. Because of this intent, the package was written as a family of independent subroutines with a separate subroutine for each specific property or set of related properties. Thus a user with limited needs can work with only those subroutines required for his program. Author

N70-30062# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

FORMULA FOR CALCULATING THE VISCOSITY OF PETROLEUM OILS AT LOW TEMPERATURES

Sh. S. Gadzhiev 2 Oct. 1969 9 p refs Transl. into ENGLISH from Azerb. Neft. Khoz. (Baku), v. 45, no. 9, 1966 p 39–40
(AD-700398; FTD-HT-23-544-68) Avail: CFSTI CSCL 11/8

In order to study the dependence of the viscosity on temperature of lubricating fractions in individual groups of hydrocarbons separated from these fractions and to create a mathematical expression which would characterize this dependence, the viscosity/temperature properties of certain distillates were investigated. The distillates included Balakhany crude oil (MK-8, machine SU, turbine L), viscosin, and also individual groups of hydrocarbons separated from these distillates and various compositions of these groups of hydrocarbons in a broad temperature interval (-50C-100C). Author (TAB)

N70-30094# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

LABORATORY STUDY OF ANTICORROSION PROPERTIES OF LUBRICANTS CONTAMINATED WITH FUNGI

V. N. Shaposhnikova et al 6 Oct. 1969 12 p ref Transl. into ENGLISH from Nauchn. Dokl. Vysshei Shkoly. Biol. Nauki (Moscow), v. 11, no. 7, 1968 p 134–136
(AD-700791; FTD-MT-24-194-69) Avail: CFSTI CSCL 11/8

A laboratory method was developed for evaluating the microbiological stability of lubricants and their anticorrosion properties in presence of such microbiological contaminants as fungi. Metal sheets 5 x 5 cm were coated with a 2-4 mm thick lubricant film and stored in presence of distilled water at 28-30C in an exsiccator. One series of metal samples was stored under identical conditions but without lubricant coating, another series of lubricant coated sheets was contaminated with the type of fungi cultures recommended by the International Electro-technological Commission in Geneva in 1954 for testing the tropical stability of materials, or with fungi separated from lubricant samples stored at the Corrosion Testing Station in a rural community in the vicinity of Moscow. Evaluation after 30 days showed corrosion of uncoated metal sheets, whereas no change in coated and uncontaminated samples was found after 160 days; after 80 days fungus growth was noted on contaminated lubricant films, but the metal did not corrode; slight corrosion occured on uncontaminated films of US-2 after 240 day storage. The study indicated that fungus growth occurs on the three tested lubricants, and that it causes loss of anticorrosion properties in GOI-54p and US-2. TAB

N70-30103# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ELASTIC CONSTANTS OF ORIENTED FIBERGLASS AT RAISED TEMPERATURES

D. V. Zambakhidze 3 Oct. 1969 16 p refs Transl into ENGLISH from Soobshch. Akad. Nauk. Gruz. SSR (Tiflis), v. 44, no. 1, 1966 p 173–180
(AD-700390; FTD-MT-24-174-69) Avail: CFSTI CSCL 11/5

A general differential equation was derived, which characterizes the mech. behavior of glass-reinforced plastics at varying deformation rates. When 0.08-01 percent per min. deformation rates were applied, the moduli of instantaneous elasticity and of rubber elasticity were determined. The orthotropic material SVAM, based on glass-reinforced epoxide-phenol-HCO compound containing 21-2 percent resin., was tested at various angles with respect to the fiber direction and at various temperatures by means of resistance tensometers. The stress-strain curves were recorded using a method based on free bending oscillations of the sample. Youngs modulus decreases slowly with increasing temperature up to 85 degrees and independent above 130 degrees. Analogous relations were found with Poisson coefficients. All experimental data satisfy the derived equation. Four elastic constants are adequate for completely describing orthotropic laminates. Author (TAB)

N70-30122*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

GSFC MICRO-VOLATILE CONDENSABLE MATERIALS SYSTEM FOR POLYMER OUTGASSING STUDIES

Aaron Fisher and Benjamin Mermelstein Oct. 1969 35 p refs
(NASA-TM-X-63779; X-735-69-471) Avail: CFSTI CSCL 11I

Instruments and techniques are described used by the Polymer Section for rapid quantitative screening of gases and condensables evolved from polymeric materials heated in vacuum at 125 C. The volatile-condensable-materials system is adapted from the basic Stanford Research Institute system, with specialized GSFC instrumental and operational modifications. Author

N70-30156*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FRICTION CHARACTERISTICS OF SPUTTERED SOLID FILM LUBRICANTS

Talivaldis Spalvins [1970] 22 p refs
(NASA-TM-X-52819; E-5706) Avail: CFSTI CSCL 11H

Solid film lubricants Au, MoS2, and WS2 were deposited by dc triode sputtering and MoS2 and PTFE by rf sputtering on metal and glass surfaces. The chemical composition of sputtered MoS2 films was very close to the original material. These films had a low coefficient of friction and displayed exceptionally long endurance lives. Electron microscopy, electron diffraction and scanning electron microscopy were used to analyze the films and their friction characteristics. Rf sputtered MoS2 film can be deposited on complex geometrical specimens (e.g., ball bearing cages) completely coating surface cavities and around corners with adherent film. PTFE was also rf sputtered onto glass and metal surfaces with strong adherence and a very slight change in chemical composition from the original PTFE. Author

N70-30186# Atomic Weapons Research Establishment, Aldermaston (England).

SOME TECHNICAL PROBLEMS IN THE PRODUCTION OF ALUMINUM OXIDE CERAMICS FROM ALUMINIUM EARTH

L Sztankovics Jan. 1970 22 p refs Transl. into ENGLISH from Hiradastech. Impari Kutato Int. Kozlemen. (Budapest), v. 8, no. 1, 1968 p 37 – 57
(AWRE-Trans-61) Copyright. Avail: HMSO 4s.6d.; BIS $1.00

Corundum ceramics made from Hungarian bauxite were found able to economically meet mechanical and electrical requirements. Purification methods were developed for high purity ceramic production for high frequency uses. The investigation at high temperature of the electrical properties of alumina ceramics containing additives is continuing. J.A.M.

N70-30195# Purdue Univ., Lafayette, Ind.

MATERIALS SCIENCE RESEARCH Progress Report, 1 Oct. 1968 30 Sep. 1969

1 Dec. 1969 222 p refs
(Contract ARPA SD-102)
(AD-701336; PR-8) Avail: CFSTI CSCL 11/7

Summaries are given of individual research projects in the following areas: Materials analysis; Neutron activation analysis; Band structure of n-GaSB, p-ZnTe, n- and p-InSb, and AgBr; Imperfections in p-aluminum antimonide, LiF, and other alkali halides; Kinetics; Mechanical properties of composites and metals; Molecular studies, Thermodynamic properties and phase studies; Thermophysical properties; and Transport properties. TAB

N70-30238# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

GLASS FORMATION IN THE SYSTEM P2 05-SB2 03-B2 03

T. N. Miller et al 6 Oct. 1969 14 p refs Transl. into ENGLISH from the Russian
(AD-700408; FTD-MT-24-176-69) Avail: CFSTI CSCL 11/2

The effect of composition on the formation of glass in the system P2O5-Sb2O3-B2O3 and the properties of glasses produced was determined by visual observation, X-ray diffraction analysis, IR spectroscopy, and differential thermal and thermogravimetric analysis. Results obtained by visual observations were in agreement with the X diffraction data, and melting at 1100 C gave similar results, although the region of glass formation was larger at the higher temperature. The effects observed by thermal analysis correspond to the melting and dehydration of the raw materials, followed by incompletely explained endothermic and exothermic effects which are associated with chemical and physical transformations; the last endothermic effect at 500-600 C corresponds to the simultaneous increase in the electric conductivity of the melt, indicating formation of an ionized liquid phase. The IR spectrum indicated formation of new chemical bonds. Author (TAB)

N70-30256# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE VITREOUS STATE (SELECTED ARTICLES)

T. E. Chebotareva et al 2 Sep. 1968 24 p refs Transl. into ENGLISH from the Russian
(AD-683107; FTD-HT-23-355-68) Avail: CFSTI CSCL 11/2

The topics of the articles in this report are: the spectra of potassium silicate glass and their association with its structure; the infrared transmission spectra of aluminum silicate smelts hardened to the vitreous state; and a study of the structure of sodium-zirconium-silicate glasses by infrared spectroscopy. TAB

N70-30261# Naval Ordnance Lab., White Oak, Md.

MEDIUM STRAIN RATE, TENSILE TESTING OF SELECTED PLASTIC MATERIALS

Frederick P. Stecher 10 Jul. 1970 47 p refs
(AD-701318; NOLTR-69-213) Avail: CFSTI CSCL 11/9

Stress-strain relations were obtained in tension at medium strain rates for selected plastic materials suitable for shock mitigation. Data have been acquired at room temperature for rates of strain between .001 in/in/sec and 1.00 in/in/sec. A conventional high-speed testing machine was used to obtain the data. All of the materials exhibited strain rate sensitivity over the range tested. Author (TAB)

N70-30275# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF THE WEAR RESISTANCE OF POLYMER-GRAPHITE MATERIALS (AS APPLIED TO FACE PACKINGS)

V. N. Kruzhilin et al 8 Dec. 1969 11 p refs Transl. into ENGLISH from the Publ. "Nauchnye Printsipy i Novye Metody Ispytanii Materialov dlya Uzlov Treniya" Moscow, Nauka, 1968 p 137 – 139
(AD-703169; FTD-MT-24-312-69) Avail: CFSTI CSCL 11/1

An experimental device was used to determine the wear resistance of a polymer-graphite pair of face packing rings for pumps handling HC1 and Hsub 2 SO 4. It consisted of a small pressure vessel containing HC1 and 3 atm of pressure over which was mounted a vertically rotating shaft around which was mounted a vertically rotating shaft around which the packing rings had been placed. The hard plastic ring was made of KF-10 molded plastic containing polytetrafluorethylene, ground quartz and organosilicon resin. The graphite ring was fashioned from E-grade antifriction material and all other parts of the device which came into contact with the acid were made of phenolformaldehyde impregnated graphite. Tests were conducted after a preliminary run-ib of 4-6 hr to permit the packing to wear sufficiently to provide a good seal. By this time the coefficient of friction and leakage of acid around the shaft had been reduced to acceptable minimums. It was found that after prolonged standing (overnight) the friction coefficient had increased, suggesting that there was a lack of lubricant (acid) in the friction joint. A check of the friction surfaces revealed that the plastic ring was covered with a thin graphite film that was difficult to scrape off, but which was easily removed with alcohol. Author (TAB)

N70-30325# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF THE ACTION OF ORGANIC ACIDS ON THE OXIDIZABILITY OF MINERAL OILS BY THE CHEMILUMINESCENCE METHOD

F. G. Suleymanova et al 12 Nov. 1969 13 p refs Transl. into ENGLISH from Azerb. Neft. Khoz. (Baku), v. 47, no. 6, 1968 p 37–39
(AD-702150; FTD-MT-24-269-69) Avail: CFSTI CSCL 11/8

Chemiluminescence of D-11 oil containing oleic and naphthenic acids was used to determine its oxidizability in the presence of various metals. TAB

N70-30340# Battelle Memorial Inst., Columbus, Ohio. Defense Ceramic Information Center.

BIBLIOGRAPHY ON CERAMIC FIBERS AND FIBROUS COMPOSITE MATERIALS. PART 1: LITERATURE

H. W. Rauch, Sr., comp. (GE, Philadelphia, Pa.) and W. H. Sutton, comp. (GE, Philadelphia, Pa.) Aug. 1969 49 p refs
(Contract F33615-67-C-1472)
(AD-701118; DCIC-69-4-Pt-1) Avail: CFSTI CSCL 11/5

The bibliography presents a collection of nearly 1800 citations on ceramic fibers and composite materials, which were selected from available literature up to January, 1969. The principal subject matter is concerned with the advanced, high-modulus, high-strength ceramic fibers that are available in continuous lengths (filaments) or as short single crystals (whiskers). Some reference literature on other fibers, such as glass filaments or metal wires, also are included. Author (TAB)

N70-30341# Battelle Memorial Inst., Columbus, Ohio. Defense Ceramic Information Center.

BIBLIOGRAPHY ON CERAMIC FIBERS AND FIBROUS COMPOSITE MATERIALS. PART 2: PATENTS

H. W. Rauch, Sr., comp. (GE, Philadelphia, Pa.) and W. H. Sutton, comp. (GE, Philadelphia, Pa.) Aug. 1969 29 p refs
(Contract F33615-67-C-1472)
(AD-701119; DCIC-69-4-Pt-2) Avail: CFSTI CSCL 11/5

The document presents a collection of over 600 patents on ceramic fibers and composite materials, which were selected from available listings up to January, 1969. The principal subject matter is concerned with the advanced, high-modulus, high-strength ceramic fibers that are available in continuous lengths (filaments) or as short single crystals (whiskers). Some patents on other fibers, such as glass filaments or metal wires are also included. Author (TAB)

N70-30372# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

QUESTIONS OF FRICTION AND PROBLEMS IN LUBRICATION: SELECTED ARTICLES

A. I. Elkin et al 21 Jan. 1970 101 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Nauchn. Sov. Po Treniyu i Smazki (Moscow), 1968 p 116–121, 151–155, 161–172, 179–201, 207–214
(AD-702999; FTD-HT-23-166-69) Avail: CFSTI CSCL 11/8

Contents: Effect of temperature on the friction properties of plastics; Study of the structure of contact spots; Investigation of surface geometry; Dispersion medium and the properties of silica gel plastic greases; Resistance of consistent lubricants to rotation of large antifriction bearings at low temperatures; Solid lubricant coatings for titanium; Investigation of the state of an oil film during reciprocating sliding friction; Cyclotriphosphazine derivatives as antiwear additives during boundary friction of steel under conditions of high sliding speeds. TAB

N70-30382# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ADDITIVES TO LUBRICATING OILS: SELECTED ARTICLES

A. M. Kuliev et al 17 Dec. 1969 14 p refs Transl. into ENGLISH from Prisadki k Smaz. Maslam, Vopr. Sinteza, Issl. i Primeneniya Prisadok K Maslam, Toplivam i Polimernym Materialam (USSR), 1967 14 p
(AD-702988; FTD-MT-24-289-69) Avail: CFSTI CSCL 11/8

Contents: Synthesis and investigation of new antioxidant additive INKhP-40; Antifriction and antiwear additives on the basis of products from the reaction of alkyl and aryl ethers of glycerol alpha-monochloro; Hydrin and beta-chlorethyl ether of phosphorus acid dichloride; Alkylation of phenol by kerosene from the thermal cracking of mazut and by polymer distillate in the presence of a KU-2 catalyst; Investigation of the compatibility of sulfur-containing diphosphites with alkylphenol- and sulfonate-type additives. TAB

N70-30395*# Stanford Univ., Calif. Dept. of Materials Science.

THE EFFECT OF TEMPERATURE AND FIBER ORIENTATION ON THE STRENGTH AND DEFORMATION CHARACTERISTICS OF FIBER COMPOSITES

Fathi Aref Ibrahim Darwish Oct. 1969 195 p refs
(Grant NGR-05-020-039)
(NASA-CR-110343; SU-DMS-70-T-7; TR-8) Avail: CFSTI CSCL 11D

The effect of temperature and fiber orientation on the strength and deformation characteristics of the unidirectionally solidified Al-Al3Ni eutectic alloy was investigated by means of tension and slowbend testing. The tensile behavior of the composite in both the longitudinal (parallel to fiber axis) and transverse (perpendicular to fiber axis) direction was evaluated in the temperature range −196 C to 200 C. It was found that a drop in temperature from 200 C down to −196 C causes the composite strength to increase by as much as 100%. Although the density of cracked fibers, when the composite is loaded parallel to fiber axis, is shown to increase under increasing applied stress, permature fiber failure does not lead to instability and the composite strength is primarily determined by the average fiber strength. Taking plasticity of the matrix into account by linearizing its stress-strain curve, the longitudinal strength of the composite was predicted from the individual properties of its components. Author

N70-30412# Sandia Corp., Livermore, Calif.

DEPENDENCE OF CERTAIN PROPERTIES OF POLYSTYRENE, POLYMETHL METHACRYLATE AND THEIR COPOLYMER ON THE MOLECULAR WEIGHT [ZAVISIMOST NEKOTORYKH SVOISTV POLISTIROLA, POLIMETILMETAKRILATA I IKH SOPOLIMERA OT MOKEKULYARNOGO VESA]

I. I. Karyauchyunas et al May 1969 19 p refs Transl. into

ENGLISH from Lietuvos TSR Mokslu Akad. Darbai, Ser. B (Vilna), v. 1, no. 32, 1963 p 83-92 Sponsored by AEC
(PB-186201T; SCL-T-69-253) Avail: CFSTI CSCL 111

The paper determines by an ultrasonic method how the molecular weight and its distribution affect some of the physical properties of polystyrene (bulk polymer D-I), bulk-polymerized polymethyl methcrylate, and their 50:50 copolymer. The veolcity of longitudinal and transverse ultrasound waves through individual fractions of polymers depends on the molecular weight of these fractions. By measuring the velocity of ultrasound waves, one can determine the fundamental physical properties of polymers, and thus predict their applications. Author (USGRDR)

N70-30436 European Organization for Nuclear Research, Geneva (Switzerland).

EFFECT OF RADIATION ON MATERIALS AND COMPONENTS. PART 1: RADIATION EFFECTS ON POLYMERIC MATERIALS. PART 2: RADIATION PROBLEMS RELATING TO HIGH-ENERGY ACCELERATORS

M. H. Van de Voorde 26 Feb. 1970 57 p refs Presented at CERN Lecture Ser., Academic Training Program, 1968 - 1969
(CERN-70-5) Copyright. Avail: Issuing Activity

Radiation effects on polymeric materials are discussed in terms of radiation-induced phenomena, factors that influence the radiation effects, and radiation resistance of polymeric materials. The problem of radiation damage, which is associated with the radiation generated in high energy accelerators, is considered in terms of dose levels around high energy accelerators and radiation resistance of materials and components. J.M.C.

N70-30498 National Lending Library for Science and Technology, Boston Spa (England).

THE EFFECT OF THE FILM-FORMING PROPERTIES OF POLYMER DISPERSIONS ON THE MECHANICAL PROPERTIES OF LEATHER [VLIYANIE PLENKOOBRAZUYUSHCHIKH SVOISTV DISPERSII POLIMEROV NA MEKHANICHESKIE SVOISTVA KOZHI]

K. M. Zurabyan et al 1969 15 p refs Transl. into ENGLISH from Kozh. Obuvn. Prom. (USSR), v. 10, no. 9, 1968 p 29-35
(NLL-RTS-5575) Avail: Natl. Lending Library, Boston Spa, Engl.: 17s 6d or 2 NLL photocopy coupons

The effect of high molecular weight polymeric impregnation on mechanical properties of leather such as water resistance and vapor permeability was studied with polymer dispersions in chrome tanned leather. The changes in the mechanical properties of density, and tensile strength by impregnation with methyl acrylate, methyl methacrylate, and chloroprene-methyl methacrylate are tabulated. It is concluded that optimum physico-mechanical properties in the peripheral regions of the leather are achieved with 3% by weight of the film-forming polymers. F.O.S.

N70-30542# Akron Univ., Ohio. Inst. of Polymer Science.

DYNAMIC RESPONSE AND DAMPING BEHAVIOR OF HETEROGENEOUS POLYMERS Final Report, 31 May 1967 - 30 Jun. 1969

Maurice Morton, N. W. Tschoegl and D. Froelich Wright-Patterson AFB, Ohio AFML Dec. 1969 46 p refs
(Contract AF 33(615)-5008)
(AD-701736; AFML-TR-67-408-Pt-2) Avail: CFSTI CSCL 11/9

The mechanical properties of a polystyrene - 1,4-polybutadiene polystyrene block copolymer of molecular weight 9500/37500/9500 were determined at temperatures between -60 and 130C in sinusoidal shear over a frequency range from 25 to 1250 Hz, in tensile stress relaxation from -70 to 70C over a time scale ranging from 1 to 1000 sec, and in tensile creep from -40 to 75C over a time scale from 10 to 10,000 sec. The dynamic mechanical properties of a 1,2-polybutadiene - polystyrene block copolymer of molecular weight 160,000/40,000 were measured at ten temperatures, between -10 and 80C over a frequency range from 250 to 2500 Hz. A firm mathematical and theoretical foundation was established which is essential for the continued development of energy absorption materials. Author (TAB)

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see: 08 Computers.

N70-29207# Georgia Univ., Athens. Dept of Statistics.

TABLES FOR SIGNIFICANCE TESTS FOR VIRTUAL CLUSTERS

Rolf E. Bargmann and Richard Graney Oct. 1969 49 p
(Contract N00014-69-A-0423; Proj. Themis)
(AD-700902; Themis-UGa-2; TR-36) Avail: CFSTI CSCL 12/1

The report contains two sets of tables, and instructions for their use. The first set is concerned with the distribution of nearest neighbors in terms of angular separation, under the hypothesis of random directions. Critical points, .05, .01, and .001 levels are given for 2(1) 70 points and 2(1) 20 dimensions. The second set of tables reports the number of points needed to reach significant overdetermination of virtual clusters, at the .05 and .01 levels of significance. Author (TAB)

N70-29211# Naval Postgraduate School, Monterey, Calif.

A STUDY OF DIGITAL FILTER-OBSERVER SYSTEMS USING THE SECOND METHOD OF LYAPUNOV

Edward Clair Rozelle Jun. 1969 86 p refs
(AD-701668) Avail: CFSTI CSCL 12/1

The basic filter-observer equations of Kalman for optimal and suboptimal filters are studied using the concepts of Lyapunov functions and stability theory. The Second Method of Lyapunov is used to form a basis for comparison of the convergence rates of such filters. Lyapunov functions are also used to derive constraining relations for the elements of the filter gain matrix leading to design criteria for suboptimal filters. A derivation of the optimal filter gain based upon the Lyapunov function of a random variable is given. This derivation shows that the optimal filter converges most rapidly. A design of a suboptimal filter for one class of signal models is given based solely upon stability constraints. Author (TAB)

N70-29233 Virginia Polytechnic Inst., Blacksburg.

A COMPARISON OF THE CLASSICAL AND INVERSE METHODS OF CALIBRATION IN REGRESSION

Martin Amos Thomas (Ph.D. Thesis) 1969 149 p
Avail: Univ. Microfilms: HC $7.00/Microfilm $3.00 Order No. 69-19986

The linear calibration problem, frequently referred to as inverse regression or the discrimination problem can be stated briefly as the problem of estimating the independent variable x in a regression situation for a measured value of the dependent variable y. The experimental design problem for the inverse estimator is explored first using the criterion of minimizing the average or integrated mean squared error, and the resulting optimal and near optimal designs are then compared with those for the Classical estimator which were recently derived by Ott and Myers. Optimal designs are developed for a linear approximation when the true model is linear and when it is quadratic. In both cases, the optimal designs depend on unknown model parameters and are not realistically useable. However, designs are shown to exist which are near optimal and do not depend on the unknown model parameters. For the linear approximation to the quadratic model, these near optimal designs depend on N, the number of observations used to estimate the model parameters, and specific designs are developed and set forth in tables for N = 5(1)20(2)30(5)50. Dissert. Abstr.

N70-29244 Houston Univ., Tex.

NUMERICAL SOLUTIONS OF THE SCALAR HELMHOLTZ EQUATION

James Hubert Boyd, Jr. (Ph.D. Thesis) 1968 51 p
Avail: Univ. Microfilms: HC $3.00/Microfilm $3.00 Order No. 69-6053

Numerical methods for solving the scalar Helmholtz equation were investigated and are discussed. These methods are applicable to many realistic acoustic radiation problems. It is shown that boundary conditions of the first and second type are easily handled; the Sommerfeld radiation condition was also successfully utilized as an external boundary condition, using a complex velocity potential. The strategies used with the method of particular solutions provide a direct method for solving these problems. This method is illustrated by solving the classical acoustics problem of a spherical piston. The results obtained are shown to be in good agreement with the analytical solution. The method is also applied to the problem of a flat piston set in a sphere, and the results appear to be reasonable. Investigation revealed that least-squares filtering applied to the finite difference operators can effectively reduce the growth of truncation errors. Dissert. Abstr.

N70-29245 Case Western Reserve Univ., Cleveland, Ohio.

THE DESIGN AND CONTROL OF DISTRIBUTED SYSTEMS VIA LYAPUNOV'S DIRECT METHOD

Thomas Edward Baker (Ph.D. Thesis) 1968 136 p
Avail: Univ. Microfilms: HC $6.60/Microfilm $3.00 Order No. 69-9390

By means of Lyapunov's direct method stability conditions are established for a large class of distributed systems. Both single and double integral norms of the system state space are considered as candidates for Lypunov functionals. Following the establishment of the stability framework for distributed systems, several design techniques are developed. A method is presented for the selection of stable boundary control algorithms. An identification technique is developed which is suitable for identifying distributed parameters on line without disturbing the normal operation of the process. Several techniques are presented for the design of feedback controllers for distributed systems. Several optimization procedures are discussed: the minimization of an integral of performance, the maximization of the speed of response, and time optimal control. The design techniques are illustrated with numerous examples. Dissert. Abstr.

N70-29246 Texas Univ., Austin.

THE TWO-DIMENSIONAL Z TRANSFORM WITH REAL DOMAIN AND PARAMETERS

Sterling Cromwell Crim (Ph.D. Thesis) 1968 79 p
Avail: Univ. Microfilms: HC $4.20/Microfilm $3.00 Order No. 69-6132

The necessary definition, theorems, and transforms are provided as the basis for the originally developed Z-transforms presented. The Z-transform can be extended to two dimensions, an extension which is analogous to that of the Laplace transform to two dimensions. Definitions, theorems, and transforms for the two dimensional Z-transform and a table of the results are presented. Dissert. Abstr.

N70-29251 Massachusetts Univ., Amherst.

GREEN'S RELATIONS IN FUNCTION SYSTEMS AND APPLICATIONS

David Paul Cargo (Ph.D. Thesis) 1968 66 p
Avail: Univ. Microfilms: HC $9.00/Microfilm $3.00 Order No. 69-6697

Green's relations are completely characterized in function systems with the right subinverse property and the left Schutzenberger group of a class is naturally identified with a certain subgroup of such a system. In the light of these ideas, the notions of canonical decomposition and stability are investigated. These results are applied to Babbage's equation and to the generalized idempotency equation. It is shown that, if these equations can be completely solved in certain subgroups, then all solutions can be determined, and that each solution to Babbage's equation is the disjoint union of a permutation and a nilpotent. Finally, a generalization of coset decomposition is studied. In the finite case, it is shown that the construction reduces in congruence modulo a subgroup. In an appropriate context, this yields a generalization to semigroups of Polya's counting theorem. Dissert. Abstr.

N70-29288# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md

ON THE SIMULTANEOUS APPROXIMATION OF FUNCTIONS AND THEIR DERIVATIVES

E. A. Bredikhina 27 Oct. 1969 29 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Mat. (Moscow), v. 28, no. 4, 1964 p 757 772
(Contract NOw-62-0604-c)
(AD-700356; APL-CLB-3-T-595) Avail: CFSTI CSCL 12/1

A discussion is given of the asymptotic form of the approximation to two classes of uniformly almost-periodic functions, with bounded r-th derivatives, by entire functions of exponential type. Author (TAB)

N70-29290# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

SMOOTHNESS OF SOLUTIONS OF DEGENERATING ELLIPTIC EQUATION

M. F. Freidlin 22 Sep. 1969 40 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Mat. (Moscow), v. 32, no. 6, 1968 p 1391 1413
(Contract NOw-62-0604-c)
(AD-700353; APL-CLB-3-T-604) Avail: CFSTI CSCL 12/1

It is proven that the generalized solution of boundary-value problems for degenerating second-order equations satisfies Holder boundary condition under broad assumptions. An example is given, showing that a greater smoothness of the solutions cannot be achieved only by increasing the smoothness of the data given in the problem. Conditions for the existence of derivatives of the generalized solution are clarified. The investigation is carried out by means of probability methods. Author (TAB)

N70-29298 California Inst. of Tech., Pasadena.

COMBINATORIAL PROPERTIES OF FINITE GEOMETRIC LATTICES

Curtis Greene (Ph.D. Thesis) 1969 31 p
Avail: Univ. Microfilms: HC $3.00/Microfilm $3.00 Order No. 69-19588

Let L be a finite geometric lattice of dimension n, and let w(k) denote the number of elements in L of rank k. Two theorems about the numbers w(k) are proved: first, w(k) > or = to w(1) for k = 2, 3, ...,n-1. Second, w(k) = w(1) if and only if k = n-1 and L is modular. Several corollaries concerning the matching of points and dual points are derived from these theorems. Both theorems can be regarded as a generalization of a theorem of de Bruijn and Erös concerning lambda = 1 designs. The second can also be considered as the converse to a special case of Dilworth's theorem on finite modular lattices. These results are related to two conjectures due to G.-C. Rota. The unimodality conjecture states that the w(k)'s form a unimodal sequence. The Sperner conjecture states that a set of non-comparable elements in L has cardinality at most max |w(k)|. In this thesis, a counter example to the Sperner conjecture is exhibited. Dissert. Abstr.

N70-29485*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

CORRELATION CURVES OF RETROACTIVELY FILTERED DATA

J. Brisco Stephens and John M. Locklin *In its* Res. on Electromagnetic Correlation Tech. 17 Mar. 1970 p 139 – 147 (See N70-29479 15-14)
Avail: CFSTI CSCL 12A

A concept for retroactively filtering a correlation curve is discussed and the results given. Normally, the data are filtered before being correlated with the net result that, if the limits you have set for your high and low pass filters are not suitable, the data must be completely reprocessed. Since the data must be either digitized or processed through a digital filter and then recorrelated, the time lost is considerable. Besides, when the data have been reprocessed, there is no assurance that the filters are still correctly set. Further, this process tends to make filtering of data in near-real-time wind measurements of limited value. The use of retroactive filtering to produce quickly filtered correlation curves from unfiltered data is demonstrated. This is done by Fourier transforming the correlation curves into the spectra, choosing the frequency range of interest (omitting any instrument noise frequencies), and then Fourier-transforming the spectra back into the time domain. Author

N70-29486*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

THE RELIABILITY COEFFICIENT FOR CROSS-COVARIANCE

J. Briscoe Stephens and Benjamin C. Hablutzel *In its* Res. on Electromagnetic Correlation Tech. 17 Mar. 1970 p 149 – 165 refs (See N70-29479 15-14)
Avail: CFSTI CSCL 12A

The concept for the reliability coefficient of a convariance curve has been developed to improve previous methods for identifying a peak through confidence levels which employ an arbitrarily chosen probability. The technique described differs from the technique traditionally used for peak identification in that, rather than setting an arbitrary probability, the probability is now determined as a function of the statistical error and the covariance coefficient. For lack of a better term, this function has been defined as the reliability coefficient. The physical significance and the reliability coefficient are discussed in terms of a stationary model. Results from the application of the reliability concept to actual atmospheric cross-beam data are discussed. Author

N70-29507# Wisconsin Univ., Madison. Water Resources Center.

STOCHASTIC PROGRAMMING: A SURVEY

Charles E. Mc Quillan Mar. 1969 67 p refs
(Contract C-1228)
(PB-189535; W69-09772) Avail: CFSTI CSCL 12B

The work provides an organization and summary of the major results in the field of stochastic (or probabilistic) programming. The purpose of the work is to give an overview of the field and references for those who wish to investigate further. Initially, a very general problem of programming under uncertainity is defined. Next, various ways of interpreting this problem and the resulting methods of handling its uncertainty are discussed. The bulk of the paper is devoted to those interpretations which appear to have received the most attention in the literature: vector optimization, the distribution of the optimum value, programs with recourse, and chance constrained programs. Finally, a few special topics are considered. Author (USGRDR)

N70-29510# California Univ., Berkeley. Operations Research Center.

SEVERAL DYNAMIC PROGRAMMING ALGORITHMS AND THEIR APPLICATION TO A DAM PROBLEM

Marc H. Blanc Dec. 1969 57 p refs
(Grant NSF GK-1684)
(PB-189711; ORC-69-40) Avail: CFSTI CSCL 12B

The report is a comparative study of three dynamic programming type algorithms. The rationale and motivations were found in studying the optimization of the scheduling of complex hydro-electric systems. The first part of the report is concerned with the formulation in mathematical terms of the corresponding control problem and the description of the algorithms. Then a typical and real dam problem is considered and solved by each of the three methods, including a cross testing of the procedure and several changes of parameters. The results are displayed in arrays and curves and briefly commented. Finally, a variational method is introduced which has the combined features of a dynamic programming algorithm and a gradient procedure. Author (USGRDR)

N70-29516# Brown Univ., Providence, R.I. Div. of Applied Mathematics.

THE REPRESENTATION OF CURVES AND SURFACES

J. Harold Ahlberg, Edwin N. Nilson, and Joel N. Williams Jan. 1970 19 p refs
(Contract Nonr-562(36))
(AD-701350) Avail: CFSTI CSCL 12/1

The report contains an expanded text of a contributed paper presented by the authors at the Joint Conference on Mathematical and Computer Aids to Design, Anaheim, California, October 1969. The report is largely concerned with the advantage of using a cardinal spline representation when a number of splines are involved in order to reduce storage requirements. A basis of cardinal splines is introduced which requires only the storage of two cubics to construct the basis elements. This requires that the mesh be uniform, however, and the problem of imposing a uniform mesh is also considered. Author (TAB)

N70-29536# Minnesota Univ., Minneapolis. Dept. of Statistics.

PLAY-THE-WINNER RULE AND INVERSE SAMPLING IN SELECTING THE BETTER OF TWO BINOMIAL POPULATIONS

Milton Sobel and George H. Weiss Jul. 1969 15 p refs
(Grants NSF GP-9018; NSF G-11021)
(TR-124) Avail: Issuing Activity

The comparison of two different sampling rules of independent binomial populations was formulated within the framework of ranking and selection problems. The sampling rules, play-the-winner and vector-at-a-time, generating new trials after success and no stopping between observations are evaluated. J.A.M.

N70-29546# California Univ., Berkeley. Operations Research Center.

A NOTE ON CUTTING-PLANE METHODS WITHOUT NESTED CONSTRAINT SETS

Donald M. Topkis Dec. 1969 13 p refs
(Contract N00014-69-A-0200-1010)
(AD-700697; ORC-69-36) Avail: CFSTI CSCL 12/2

It is shown that the framework of AD-694 457 can be used to give a simplified proof of conditions given by Eaves and Zangwill (which weaken the uniform concavity requirement on the objective function used by the author in AD-694 457) under which inactive constraints may be dropped after each subproblem in cutting-plane algorithms. The convergence rate established in AD-694 457 is improved and its application extended. Author (TAB)

N70-29547# Minnesota Univ., Minneapolis. Dept. of Statistics.

INVERSE SAMPLING AND OTHER SELECTION PROCEDURES FOR TOURNAMENTS WITH 2 OR 3 PLAYERS

Milton Sobel (Imperial Coll., London) and George H. Weiss (Imperial Coll., London) Jul. 1969 44 p refs Revised
(Grant NSF GP-9018)

(TR-116A) Avail: Issuing Activity

The problem of selecting the best of k = 2 or 3 players in a tournament from a ranking and selection point of view is considered when only independent win or lose binary comparisons are allowed. The main emphasis is on a 'Drop the Loser' (DL) sampling rule, which, for three players, states that the loser of any game is the one that does not play in the very next game. This DL-sampling rule is regarded as a 3-player binary-comparisons analog of the Play the Winner rule for the 2-armed bandit problem and for the same problem in the context of clinical trials. Some inverse sampling rules are considered with and without early elimination of non-contenders and the results are compared with those of other sequential procedures. Author

N70-29551# Sandia Corp., Albuquerque, N.Mex.

MEAN FIRST-PASSAGE TIME FOR A STATIONARY GAUSSIAN MARKOV PROCESS

D. A. Jelinek Jan. 1970 14 p refs

(PB-189709; SC-RR-70-63) Avail: CFSTI CSCL 12A

Numerical results for the mean first-passage time for a stationary Gaussian Markov process (an Ornstein--Uhlenbeck process) are presented for starting points of 0, plus or minus 1, plus or minus 2, and plus or minus 3 standard deviations away from the mean and for threshold values ranging from 0 to 12 standard deviations above the mean. Author (SGRDR)

N70-29591*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ERROR CONTROL USING A CONCATENATED CODE

Bernhard Dorsch and Warner H. Miller Washington Jun. 1970 20 p refs

(NASA-TN-D-5775; G-976) Avail: CFSTI CSCL 12A

A coding scheme is described which achieves, in some cases, an improvement of two orders of magnitude in data quality for the infrared interferometer spectrometer experiment to be used on the Mariner Mars Probe 1971. This improvement concerns the existing biorthogonal channel. The coding scheme is a concatenation of a biorthogonal code with a generalized Hamming code. A detection philosophy is described which allows the experimenter to select a processing-decoding algorithm to maximize data quantity for a given probability of bit error threshold. Author

N70-29597# Yale Univ., New Haven, Conn. Dept. of Administrative Sciences.

STEP SIZE PROBLEMS

Jose Riverola Jan. 1970 150 p refs

(Grant NSF GS-01692)

(PB-189638; TR-29) Avail: CFSTI CSCL 12B

An investigation mainly concerned with qualitative properties of the optimal policies for a variety of dynamic systems under uncertainty is reported. USGRDR

N70-29600# California Univ., Livermore. Lawrence Radiation Lab.

AN ISOPERIMETRIC INEQUALITY IN THE THEORY OF SELF-CONTAINED NUMERICAL INTEGRATION FORMULAS

F. N. Fritsch Sep. 1969 22 p refs Presented at the 3d Symp. on Inequalities, Los Angeles, 1-9 Sep. 1969 Sponsored by AEC

(PB-188143; UCRL-72066) Avail: CFSTI CSCL 12A

A closed region R that satisfies the conditions the integral over R of ((x sub i) (x sub j)dx) - or + delta sub ij I sub zero, where delta sub ij is the Kronecker delta, is said to be Stroud normal. The C-radius rho (R) is the radius of the largest sphere centered at the centroid of R that is contained in R. Conjecture 1: Among all convex Stroud normal subsets of E superscript n7 rho assumes its minimum on the n-simplex and its maximum on the closed ball. It is shown how this conjecture arose in the theory of self-contained numerical integration formulas. In the case n = 2 the conjecture is proved for regular polygons and is shown to be equivalent to Conjecture 2: Among all convex Stroud normal m-gons, p-rho assumes its minimum on the triangle and its maximum on the regular m-gon. Author (USGRDR)

N70-29613*# Brown Univ., Providence, R.I. Div. of Applied Mathematics.

FUNCTIONAL DIFFERENTIAL EQUATIONS

Jack K. Hale [1969] 32 p refs

(Grants NGL-40-002-015; AF-AFOSR-693-67B)

(NASA-CR-86404) Avail: CFSTI CSCL 12A

The class includes difference equations, differential-difference equations as well as retarded functional differential equations; that is, those systems in which the derivative of the state of the system at a given time depends only upon the state of the system for previous values of time. If the solutions of the system have enough smoothness properties, then they satisfy equations for which the derivative of the state at a given time depend both upon the state and the derivative of the state for previous values of time; that is, neutral functional differential equations. The advantage in the approach seems to be the unification that is provided as well as the fact that a geometric theory becomes more feasible. Author

N70-29615*# Connecticut Univ., Storrs. Dept. of Electrical Engineering.

FACTORS INFLUENCING CONVERGENCE OF A LEARNING SYSTEM

G. E. Zajac May 1970 45 p refs

(Grant NGL-07-002-002)

(NASA-CR-110363) Avail: CFSTI CSCL 12A

The effect of the choice of measurement rays on the algorithm for a learning control system is investigated. The algorithm is modified to reduce convergence time by a factor of 1/(N+1) where N is the order of the system. The modified algorithm is applied to a third order example. Author

N70-29655*# Wisconsin Univ., Madison. Theoretical Chemistry Inst.

ITERATIVE SOLUTION OF PERTURBATION EQUATIONS

D. K. Harriss, J. O. Hirschfelder, and Y. M. Chan 10 Sep. 1968 17 p refs

(Grant NsG-275-62)

(NASA-CR-110361; WIS-TCI-316) Avail: CFSTI CSCL 12A

Iterative procedures for the solution of perturbation equations are considered. Limitations of a procedure recently proposed are discussed, and modifications are suggested. The relationships between the various procedures are shown. Illustrative applications are given. Author

N70-29658*# Brown Univ., Providence, R.I.

ACCELERATED PROCEDURES FOR THE SOLUTION OF DISCRETE MARKOV CONTROL PROBLEMS Final Report

H. J. Kushner and A. J. Kleinman [1970] 24 p refs

(Grants NGL-40-002-015; AF-AFOSR-0693-67-A; NSF GK-2788)

(NASA-CR-86402) Avail: CFSTI CSCL 12A

Accelerated procedures for computing optimal controls for a Markov chain model are discussed, and numerical results are presented. For the example, one of the methods described gave a 10 fold decrease in computation time over a more usual procedure of dynamic programming. Author

N70-29675# Argonne National Lab., Ill.

FUNCTIONALS FOR FLUX SYNTHESIS WITH

DISCONTINUOUS TRIAL FUNCTIONS
P. Lambropoulos and Victor Luco Oct. 1969 23 p refs
(Contract W-31-109-eng-38)
(ANL-7627) Avail: CFSTI

It is shown that the functionals originally used in variational flux synthesis with continuous trial functions can also be used with discontinuous functions, provided they are modified so as to yield physically meaningful stationarity conditions at the discontinuity interfaces. It is furthermore demonstrated that various functionals proposed in the past for such use are equivalent, without any among them having any added validity. Some mathematical difficulties that had been attributed to the use of discontinuous trial functions are clarified and shown to have been the result of inappropriate calculational methods. Author (NSA)

N70-29704*# Texas A&M Univ., College Station. Inst. of Statistics.
STOCHASTIC COMPARTMENTAL ANALYSIS: SOME APPLICATIONS AND EXAMPLES OF ESTIMATION IN A PULSE LABELLED SYSTEM
J. H. Matis, H. O. Hartley, and W. C. Ellis May 1970 28 p refs
(Grant NGR-44-001-097)
(NASA-CR-110364; TR-3) Avail: CFSTI CSCL 12A

Compartmental analysis, though previously applied mainly to the biomedical sciences, provides a model pertinent to a wide variety of other areas of endeavor. The flexibility of application is illustrated by citing models from diverse fields which are compartmental in nature. The stochastic behavior of the models is outlined and subsequently used to develop an estimation procedure. Two examples illustrate the application of the estimation technique. The first example, a simulation, demonstrates the weakness of ordinary least squares estimation, which is heretofore used, in stochastic compartmental models. A biological experiment forms the second example and it also confirms the above conclusion. Author

N70-29730*# Wisconsin Univ., Madison. Theoretical Chemistry Inst.
DIRECT CALCULATION OF SECOND-ORDER DENSITY MATRIX. 1: THEORY OF THE GREEN'S FUNCTION TECHNIQUE
Jack Simons 16 Dec. 1969 28 p refs
(Grant NGL-50-002-001)
(NASA-CR-110369; WIS-TCI-374) Avail: CFSTI CSCL 12A

A method is presented for directly determining the second order density matrix of a system of particles with pairwise additive interactions. The result is obtained as a contour integral involving the two particle Green's function. The random phase approximation is made and the evaluation of the Green's function is reduced to a simple matrix problem. An outline of the computational method is presented, and possible applications are discussed. Author

N70-29732# Hawaii Univ., Honolulu.
A NOTE ON THE RELAXATION ALGORITHM FOR SOLVING MATRIX EQUATIONS
Rahul Chattopadhyay Feb. 1970 5 p refs
(Contract F44620-69-C-0030)
(AD-702533; THEMIS-A70-1; AFOSR-70-0698TR) Avail: CFSTI CSCL 12/1

The relaxation method for the solution of matrix equations is shown to be convergent when the coefficient matrix is not necessarily positive definite. The relaxation method appears to be a special case of the sequential projection method of Householder. Author (TAB)

N70-29739*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THEORY OF SEPARATION OF VARIABLES FOR LINEAR PARTIAL DIFFERENTIAL EQUATIONS OF THE SECOND ORDER IN TWO INDEPENDENT VARIABLES
Marvin E. Goldstein Washington May 1970 136 p refs
(NASA-TN-D-5789; E-5391) Avail: CFSTI CSCL 12A

Necessary and sufficient conditions which any linear second-order partial differential equation in two independent variables must meet whenever it can be transformed into a separable equation are given. These conditions are used to develop a calculational procedure for determing whether any given equation of this type can be transformed into a separable equation and also to develop a procedure for determining the various changes of variable which will lead to separable equations. Author

N70-29744*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
COMPUTATIONAL METHODS FOR MATHEMATICAL FUNCTIONS
H. C. Thacher, Jr. (Notre Dame Univ.) 15 May 1970 71 p refs
(Contract NAS7-100)
(NASA-CR-110367; JPL-TR-32-1324) Avail: CFSTI CSCL 12A

This report, adapted from lecture notes, is an expository monograph on analyses useful to problems of computing mathematical functions. Certain well-known types of infinite expansions are surveyed. These include convergent and asymptotic series in general and power series in particular; as well as continued fractions and rational functions. Discussions of these methods emphasize numerical properties such as truncation error analysis, transformation for acceleration of convergence, and recurrence relations amenable to computation. Examples of applications are given for most methods discussed, and exercises are suggested for the various ideas proposed. Author

N70-29746*# Wisconsin Univ., Madison. Theoretical Chemistry Inst.
THE RESOLUTION OF A PERTURBED WAVE FUNCTION INTO ITS SYMMETRY COMPONENTS
Joseph O. Hirschfelder and Donald K. Harriss 10 Dec. 1968 9 p ref
(Grant NGL-50-002-001)
(NASA-CR-110368; WIS-TCI-317) Avail: CFSTI CSCL 12A

The various orders of the wave functions for a perturbed Hamiltonian can be resolved into components which transform in accordance with the irreducible representations of the unperturbed Hamiltonian. Each of these components satisfies a separate perturbation equation. It is hoped that this approach will be especially useful in considering the perturbation of degenerate states. Author

N70-29752# Rice Univ., Houston, Tex. Dept. of Mechanical and Aerospace Engineering and Materials Science.
UNIFIED APPROACH TO QUADRICALLY CONVERGENT ALGORITHMS FOR FUNCTION MINIMIZATION
H. Y. Huang 1969 31 p refs
(Grant AF-AFOSR-828-67)
(AD-702541; AAR-64; AFOSR-70-0781TR) Avail: CFSTI CSCL 12/1

A unified method to construct quadratically convergent algorithms for function minimization is described. With this unified method, a generalized algorithm is derived. It is shown that all the existing conjugate-gradient algorithms and variable-metric algorithms can be obtained as particular cases. In addition, several new practical algorithms can be generated. The application of these algorithms to quadratic functions as well as nonquadratic functions is discussed. Author (TAB)

N70-29782*# National Aeronautics and Space Administration. Electronics Research Center, Cambridge, Mass.

INFINITE PERIODIC MINIMAL SURFACES WITHOUT SELF-INTERSECTIONS

Alan H. Schoen Washington May 1970 98 p refs
(NASA-TN-D-5541; C-98) Avail: CFSTI CSCL 12A

A preliminary account of a study of the partitioning of three-dimensional Euclidean space into two interpenetrating labyrinths by intersection-free infinite periodic minimal surfaces (IPMS) is given. A construction algorithm for deriving such surfaces leads to the identification of the five cases already known, plus a number of new examples. By the use of this algorithm and other methods, a total of seventeen intersection-free IPMS were identified. Photographs of plastic models and computer-generated drawings of examples of such surfaces are shown. Also described and illustrated is an example of a nonorientable IPMS, generated from a skew pentagonal surface module. A counterpart to Schoenflies' proof that there exist only six quadrilateral modules of IPMS is mentioned. There exist only eight pentagonal modules of IPMS having noncubic Bravais lattices. Author

N70-29811*# Scripta Technica, Inc., Washington, D.C.

ON ANALYTIC AND HARMONIC TRANSFORMATIONS AND THE APPROXIMATION OF HARMONIC FUNCTIONS [OB ANALITICHESKIKH I GARMONICHESKIKH PREOBRAZOVANIYAKH I O PRIBLIZHENII GARMONICHESKIKH FUNKTSIY]

V. K. Dzyadyk Washington NASA Jun. 1970 35 p refs Transl. into ENGLISH from Ukr. Mat. Zh. (Ukrania), v. 19, no. 5, 1967 p 33-57
(Contract NASw-2036)
(NASA-TT-F-13115) Avail: CFSTI CSCL 12A

Several analytic and harmonic transformations of functions whose partial cases are polynomials in a complex region including trigonometric Jackson polynomials and others are investigated. The obtained results are applied to the summation of Faber series, approximation of harmonic functions by harmonic polynomials, and partially to the approximation of logarithmic potentials. Analytical transformations of two functions are studied when one function is given on a boundary C of a continuum K and the other is periodic and plays the role of a kernel. Author

N70-29823*# Scripta Technica, Inc., Washington, D.C.

ON THE APPLICATION OF NEWTON'S METHOD TO THE SOLUTION OF NONLINEAR BOUNDARY VALUE PROBLEMS [O PRIMENENII METODA NYUTONA K RESHENIYU NELINEYNYKH KRAYEVYKH ZADACH]

B. M. Budak, ed., et al NASA Jun. 1970 19 p refs Transl. into ENGLISH from Sb. Rabot Vychislitelnogo Tsentra (Moscow), no 6, 1967 p 17-33
(Contract NASw-2036)
(NASA-TT-F-13029) Avail: CFSTI CSCL 12A

Several versions of Newton's method are applied to the solution of boundary-value problems for systems of ordinary differential equations of the first and second order. The boundary value problems studied are encountered in the analysis of systems described by ordinary differential equations or when applying the method of straight lines to boundary-value problems for partial differential equations. Author

N70-29830# System Development Corp., Santa Monica, Calif.

LONG RANGE TRAJECTORY PREDICTION ERRORS FOR LEAST SQUARES SMOOTHING

Marvin Blum 29 Sep. 1969 18 p ref
(AD-701801; SDC-SP-3424) Avail: CFSTI CSCL 12/1

The paper presents exact formulas and graphs to determine the root mean-square error of prediction for position and velocity estimates of a target, based on least-squares smoothing. The prediction interval is taken from an end-point estimate up to ten times the smoothing interval. The r.m.s. values may be used to determine how large a search volume must be to accommodate a substantial data dropout interval. Author (TAB)

N70-29843# Akademiya Nauk URSR, Kiev.

INTERSECTIONS AND MAXIMA OF A RANDOM STATIONARY PROCESS

M. G. Bilyk *In its* Data Collection and Transmission, No. 18 1968 p 90-97 refs In RUSSIAN (See N70-29831 15-07)
Avail: CFSTI

The validity of previously derived expressions on criteria for a random stationary process is expanded in terms of specific maxima and zero-crossing conditions. Expressions are derived for finding the mean number of crossings of a continuous function whose first and second derivatives are likewise continuous. Probability density expressions are given for maxima per unit time of a random process having a chi-squared distribution. Transl. by B.E.S.

N70-29868# Aeronautical Research Labs., Melbourne (Australia).

A CURVE FITTING TECHNIQUE USING ORTHOGONAL POLYNOMIALS

M. G. J. Higgs Jun. 1969 17 p refs
(ARL/SM-338) Avail: CFSTI

Curve fitting using ordinary polynomials sometimes leads to ill-conditioned equations. This is not avoided by finding polynomials orthogonal on the same base but conditioning is improved by using tabulated polynomials, such as Legendre's, which prove to be well conditioned over the given points. The test is described for determining the order of the curve of best fit. A computer program is available to calculate the curve of best fit $y = f(x)$ to a set of data, and an inverted curve $x = g(y)$ also. Author

N70-29885# California Univ., Berkeley. Lawrence Radiation Lab.

SMOOTHING DATA WITH TOLERANCES BY USE OF LINEAR PROGRAMMING

Jonathan D. Young Nov. 1969 6 p refs
(Contract W-7405-eng-48)
(UCRL-19403) Avail: CFSTI

A method for smoothing observed data when the values of the dependent variable are assumed to lie within specified tolerance of the observed value is described. Linear programming is employed to obtain optimal smoothing of the (local) degree desired within the restraints imposed by the tolerances. First- and third-degree smoothing are discussed, but the method may be extended to higher order. Author (NSA)

N70-29913# System Development Corp., Santa Monica, Calif.

INFORMATION PRESERVING PROCESSES IN THE FORECASTING OF DISTRIBUTION MATRICES

Peter S. Loubal and Jay W. Mc Bride 1 Nov. 1969 35 p refs
(AD-701802; SDC-SP-3467) Avail: CFSTI CSCL 13/2

Demands for forecasting distributions of a variety of entities in many areas of regional planning could be met by a single generally applicable model. After discussing the need for such a model, the paper develops the properties that such a model should possess, placing the major emphasis on the concept of preservation of information. A simple model, which meets the major requirements, is briefly described, and a number of applications are shown. Author (TAB)

N70-29927# New Mexico Univ., Albuquerque. Dept. of Mathematics and Statistics.

A CHARACTERIZATION OF WEAK STABILITY FOR TRANSFORMATIONS

J. R. Blum and S. Natarajan Mar. 1969 5 p refs
(Grants NSF GP-5217; NSF GU-2582)
(TR-174) Avail: Issuing Activity

Let (X,A,m) be a probability space and T an invertible measure-preserving transformation on X. The notions of ergodicity, weak mixing, and mixing for T are well known. A characterization of weak stability which generalizes the result of other authors is proved. Author

N70-29951# Minnesota Univ., Minneapolis. Dept. of Statistics.

SELECTING THE t th LARGEST USING BINARY ERRORLESS COMPARISONS

Abdollah Hadian and Milton Sobel May 1969 17 p refs
(Grant NSF GP-9018)
(TR-121) Avail: Issuing Activity

Two criteria are considered for evaluating and comparing procedures for selecting the largest number using binary errorless comparisons. A minimax (or M-optimal) procedure minimizes the maximum number of comparisons needed to find the largest number. Assuming a random ordering at the outset (with equal probability for each of the n! arrangements), an E-optimal procedure is one that minimizes the expected number of comparisons required. Since the same procedure in general does not satisfy both criteria, these two criteria may be referred to as separate problems, the M-problem and the E-problem. Author

N70-29957# Imperial Coll. of Science and Technology, London (England).

PLAY-THE-WINNER SAMPLING FOR SELECTING THE BETTER OF TWO BINOMIAL POPULATIONS

Milton Sobel and George H. Weiss Minneapolis Minnesota Univ. Jul. 1969 16 p refs
(Grant NSF GP-9018)
(TR-123) Avail: Issuing Activity

The sequential allocation of treatments by an experimenter is considered for determining which of two binomial populations has a larger probability of success. Of particular interest in this study is a Play-the-Winner (PW) sampling rule which prescribes that one continues with the same population after each success and one switches to the opposite population after each failure. The performance of the PW rule is examined for the selection problem, i.e., for selecting the better population with probability P when the two single-trial probabilities, p and p', differ by at least delta, where P and delta are prescribed. A comparison is made between PW-sampling and Vector-at-a-time (VT) sampling. In comparing results a criterion used is the expected number of failures that could have been avoided by using the better population throughout. It is shown for a particular common termination rule that with delta close to zero the PW sampling is superior to VT sampling. Other comparisons are also discussed. Author

N70-30032# Sheffield Univ. (England). Dept. of Probability and Statistics.

SOME MODELS BASED ON THE INTERACTION OF TWO INDEPENDENT POINT PROCESSES

I. V. Basawa Sep. 1969 17 p refs
(RR-68/IVB-4) Avail: CFSTI

Let A and B be two independent sources emitting signals (or calls etc.). Emissions from A and B constitute two independent series of point events occurring in a continuous time. Suppose that these two point processes "interfere" with each other according to a given rule before reaching an antenna. Signals received by the antenna form another point process and it may be required to study the properties of this new process from the knowledge of the former two processes and the rule of their interaction. The problem could be formulated in a variety of contexts such as the following: particles arriving at a counter after passing through an independent filtering process, of two types of impulses, one interrupting the other before activating a certain mechanism. Models have been proposed to describe the process. Author

N70-30056# Stanford Univ., Calif. Dept. of Computer Science.

ERROR PROPAGATION BY USE OF INTERPOLATION FORMULAE AND QUADRATURE RULES WHICH ARE COMPUTED NUMERICALLY

Sven-Ake Gustafson Feb. 1970 23 p refs
(Contract N00014-67-A-0012-0029)
(AD-701358; STAN-CS-70-153) Avail: CFSTI CSCL 12/1

Approximate rules for evaluating linear functionals are often obtained by requiring that the rule shall give exact value for a certain linear class of functions. The parameters of the rule appear hence as the solution of a system of equations. This can generally not be solved exactly but only numerically. Sometimes large errors occur in the parameters defining the rule, but the resultant error in the computed value of the functional is small. In the present paper, efficient methods of computing a strict bound for this error are developed in the case when the parameters of the rule are determined from a linear system of equations. Author (TAB)

N70-30059# Harvard Univ., Boston, Mass. Dept. of Statistics.

PERFORMANCE OF A PRELIMINARY TEST OF COMPARABILITY IN OBSERVATIONAL STUDIES

W. G. Cochran 4 Feb. 1970 16 p
(Contract N00014-67-A-0298-0017)
(AD-702056; TR-29) Avail: CFSTI CSCL 12/1

The note studies the performance of a preliminary test of significance sometimes used in observational studies. The means y1, y2 of a response variable are being compared in two independent samples of size n. It is feared that the comparison may be biased because a confounding variable x may have different levels (means) in the two populations. A t-test of (x1-x2) is made. If t is not significant, (y1-y2) is used as an estimate of the population difference delta y; if t is significant, (y1-y2) is adjusted by an analysis of covariance. This procedure is found to reduce the remaining bias in the estimate of delta y to a value that does not seriously disturb tests of significance or confidence probabilities based on this estimate. If the estimation of small values of delta y is important, however, the remaining bias may still be a sizeable percentage of delta y, except with large samples. Author (TAB)

N70-30060# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ABOUT CERTAIN EXPLICIT ITERATION METHODS FOR SOLVING A MULTIDIMENSIONAL BIHARMONIC EQUATION

I. M. Molchanov 2 Oct. 1969 11 p refs Transl. into ENGLISH from Dopov. Akad. Nauk Ukr. RSR, Ser. A (Kiev), v. 30, no. 4, 1968 p 308-311
(AD-700386; FTD-HT-23-374-69) Avail: CFSTI CSCL 12/1

Two explicit iterative methods are considered for the solution of the difference analog of a multidimensional biharmonic equation in a domain having a contour parallel to the coordinate plane, when a function and its normal derivative are given on the domain boundary. The convergence of the iterative processes constructed is proven and an estimation given of the rate of convergence of the processes. Author (TAB)

N70-30118*# Tennessee Univ., Knoxville. Computing Center.

SEARCH FOR GOOD ALGORITHMS FOR PRACTICAL SOLUTIONS TO DISCRETE OPTIMIZATION PROBLEMS

Final Report

Gordon R. Sherman Mar. 1970 67 p refs
(Contract NAS8-11189)
(NASA-CR-102713) Avail: CFSTI CSCL 12A

The method of stochastic algorithms based on probability theory is applied to practical solution to discrete optimization problems. The approaches considered include partitioning problems, optimal sequencing problems, minimum path through a network, and quadratic integer programming problems. R.B.

N70-30119# Sheffield Univ. (England). Dept. of Probability and Statistics.

A CHARACTERIZATION OF G-PROCESSES AND THE POISSON PROCESSES IN R TO THE nth POWER

S. Tulya-Muhika Sep. 1969 25 p refs
(RR-66/STM-1) Avail: CFSTI

It is proved in this paper that if each point of a stochastic point process in R to the nth power is deleted with probability p (0 < or = to p < 1) and retained with probability q = 1-p (deletions being independent) and the scale is magnified by 1/q, the resulting stochastic point process tends to a Poisson process as q approaches 0 if and only if the initial process is well-distributed. It is further shown that only the Poisson process is invariant under all independent deletions and corresponding magnifications. Author

N70-30157# Columbia Univ., New York.

MEAN SQUARE INVARIANT FORECASTERS FOR THE WEIBULL DISTRIBUTION

J. Tiago de Oliveira and Sebastian B. Littauer 1 Nov. 1969 56 p refs
(Grant NSF GP-8478)
Avail: Issuing Activity

The problem of estimating future process outcomes from an observed set of results is studied as the fundamental problem of forecasting. The criterion for choice of the estimation-forecast function is shown to be the minimization of the mean square distance between observed values and the ones forecast. Results derived by direct computation, observed values, mean square forecasters, and minimal average length forecasting regions are applied to obtain mean square forecasters for Weibull and Gumbull distributions. F.O.S.

N70-30177# Wisconsin Univ., Madison. Dept. of Statistics.

PARTIAL AUTO CORRELATIONS FROM BAYESIAN VIEWPOINT AND ORTHOGONAL PARAMETRIZATION

G. E. P. Box, Gwilym Jenkins, (Lancaster Univ.) and Irwin Guttman Aug. 1969 42 p refs
(Grant AF-AFOSR-1803-69)
(AD-702115; TR-213) Avail: CFSTI CSCL 12/1

Investigations are carried out on a given series of time series observations which are generated by an autoregressive model. The joint probability density function for the time series observations is given, and from this the joint density is computed. A transformation of the time series observations is made and the Jacobian of the transformation is determined. Operations involving the autocovariance matrix of the time series observations are carried out resulting in a double symmetric matrix. From this the relationships are shown between partial autocorrelations of time series observations which are different time periods apart. An appendix is given showing these partial autocorrelations. J.M.C.

N70-30196*# Miami Univ., Coral Gables, Fla. Center for Theoretical Studies.

IMPLICATIONS OF A PARTIALLY CONSERVED DILATATION CURRENT AND CHIRAL SYMMETRY FOR THE DIMENSIONS OF LENGTH OF LOCAL FIELDS

Mario Dal Cin Feb. 1970 17 p refs
(Grants NGL-10-007-010; AF-AFOSR-1268-67)
(NASA-CR-110347; CTS-HE-70-1) Avail: CFSTI CSCL 12A

We exploit the hypothesis that the divergence of a partially conserved dilatation current is a good interpolating field for scalar particles. By means of Ward identity techniques for dilatation and chiral SU(2) × SU(2) transformations, we show that dimensions of length can be determined without any use of the canonical formalism. We obtain canonical dimensions of length if we assume single particle dominance. In general the dimensions of length have to obey certain sum rules which involve three-point functions describing strong meson interactions. Author

N70-30224# Sheffield Univ. (England). Dept. of Probability and Statistics.

ON THE ESTIMATION OF A HARMONIC COMPONENT IN A TIME SERIES WITH STATIONARY RESIDUALS. 1: INDEPENDENT RESIDUALS

A. M. Walker Sep. 1969 34 p refs Revised
(RR-671AMW-1) Avail: CFSTI

A time series is given which contains the sum of a finite number of simple harmonic terms of the form A cos w t + B sin w t, independently and identically distributed random variables each with mean zero and finite variance, and specified functions of a vector-valued parameter theta. An approximate least-squares method, proposed by Whittle, of simultaneously estimating theta and the angular frequencies and sine and cosine coefficients of each harmonic term is proved with respect to the asymptotic distribution, formulated precisely as limit theorems, for special case of independent residuals so that the parameter theta disappears. Author

N70-30225# Wagner (Daniel H.) Associates, Paoli, Pa.

STATISTICAL TESTS FOR DETECTION MODELS Summary Report

David C. Bossard 19 Feb. 1970 126 p refs
(Contract Nonr-4784(00))
(AD-702497) Avail: CFSTI CSCL 15/7

Methodology is given for statistical testing of detection models. The tests are intended for use in evaluating probabilistic models using data from operational exercises and are specifically designed to accommodate various features which arise in such data due to the fact that they are, in general, not controlled experiments. The principal new results in the report are the development of two statistical tests which are specifically designed for use when the exercises used in the tests do not constitute well defined experiments in the sense that the reconstruction of the runs subsequent to the detection event (if it occurs) is affected by the occurrence of the detection. An adaptation of the Bernoulli trials test is given as a test of the accuracy of a model in regard to the expected number of detections. The adaptation consists of revising the classical Bernoulli test statistic to apply to runs which are altered by the occurrence of detection (truncated runs). As a test of the ability of a model to predict the distribution of detections, generalizations of the classical Kolmogorov-Smirnov (K-S) test are developed, including a generalization which allows for truncated runs. Sample size requirements for the new tests are modest but they require machine computation. Computer programs are included for their implementation. Author (TAB)

N70-30248# Midwest Research Inst., Kansas City, Mo.

ON RECURSIVE COMPUTATION Interim Technical Report

Jet Wimp Wright-Patterson AFB, Ohio ARL Nov. 1969 92 p refs
(Contract AF 33(615)-2764)
(AD-700326; ARL-69-0186) Avail: CFSTI CSCL 12/1

The application of Millers algorithm is investigated for backward recursion to difference equations, where the coefficients have a representation as an asymptotic series. The convergence of several methods are discussed which are related to Millers algorithm and which can be used when Millers algorithm does not converge. A number of examples are included. Author (TAB)

N70-30262# Stanford Univ., Calif. Dept. of Statistics.

AN INEQUALITY ON THE PROBABILITY OF FAULTLESS OPERATION OF A PARALLEL SYSTEM. 1

Peter C. C. Wang 10 Feb. 1970 15 p refs

(Contract Nonr-225(52))
(AD-701317; TR-155) Avail: CFSTI CSCL 14/4

The problem of estimating the reliability characteristics of parallel systems with spares and/or repairable elements is investigated. A parallel system is such that the failure of all units causes failure of the entire system. Some bounds of higher moments are treated.
Author (TAB)

N70-30384*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

A MODIFIED SWEEP METHOD FOR CONTROL OPTIMIZATION

Daniel Colunga (Ph.D. Thesis—Texas Univ., Austin) Jun. 1970 122 p refs
(NASA-TM-X-58047) Avail: CFSTI CSCL 12A

A modified successive sweep method was devised which yields Eulerian solutions to two-point boundary value problems of control optimization. This was accomplished by requiring control satisfaction of local optimality over the entire time interval of interest while simultaneously relaxing terminal transversality requirements on the Lagrange multipliers. The method was tested successfully on several classes of problems including optimizing the roll program for an Apollo-type three-dimensional reentry trajectory so as to minimize a time integral of spacecraft heating and acceleration. This method was shown to require significantly less computer storage than the original successive sweep method while requiring numerical integration of fewer variables. In addition, the method was shown to posses rapid terminal convergence and a conjugate-point test capability.
Author

N70-30386# Junkers Flugzeug- und Motorenwerke A. G., Munich (West Germany).

LIBRATIONAL MOTION [DIE BEWEGUNG DER LIBRATIONSPUNKTE]

J. Tschauner Sep. 1969 41 p refs In GERMAN Supported by Bundesmin. fuer Wiss. Forsch.
(BMwF-FB-W-69-35) Avail: CFSTI

The motion of a small body in the gravitational field of two heavy masses is investigated for the case when the masses revolve in elliptic orbits around their common mass center. The highly nonlinear equations of this motion are reduced to the simplest form by a suitable normalization of the coordinates and by the use of the true anomaly of the revolution as independent variable. This form clearly shows the similarities to the case of circular revolution usually considered in the literature, but also shows the differences which are to be taken into account in the elliptic case. Five libration points are defined as stationary solutions for the equations of motion as in the circular case. The motion of the small body in the neighborhood of these points, described by linear differential equations with periodic coefficients, is considered in detail.
Author

N70-30389# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.

NUMERICAL EVALUATION OF ROOTS OF A POLYNOMIAL WITH COMPLEX COEFFICIENTS

Dan Wolfman Oct. 1969 17 p refs
(TAE-104) Avail: CFSTI

A general method for the solution of a polynomial equation with complex coefficients is presented and verified. The method is applicable in investigating panel flutter phenomena.
Author

N70-30445 Nottingham Univ. (England). Dept. of Geography.

COMPUTER APPLICATIONS IN THE NATURAL AND SOCIAL SCIENCES, NO. 2: SOME ASPECTS OF NETWORK ANALYSIS

M. J. Mc Cullagh Jun. 1969 42 p refs
(NA/MJM/3/69) Copyright. Avail: Issuing Activity 7s

Network analysis has become of great value during the past decade for solving problems which previously were mathematically lengthy and complex. One such problem is that of finding the shortest route through a network. A computer program which has applications in the fields of urban geography and regional planning for an algorithm which presents a solution for all shortest routes through a network is described.
ESRO

N70-30484# Tel-Aviv Univ. (Israel). Dept. of Mathematics.

ON A PROBLEM OF E. ARTIN

Marcel Herzog [1970] 19 p refs
Avail: CFSTI

A finite group with a cyclic Sylow p-subgroup P of order (p to the a power) is called a C (p to the a power) group. All perfect C (p to the a power) groups G were previously classified subject to the following two conditions: o(G) < o(P) cubed, and the Sylow p-subgroups of G constitute a (TI) set. Under these conditions the above mentioned list of groups is extended to contain SL(2,p), where p > 3 is a prime, and PSL(2,8). All non-p-solvable C (p to the a power) groups G are classified subject to the single condition o(G) < o(P) cubed. Some elementary properties of C (p to the a power) groups which are of independent interest are considered, and relevant theorems are proved.
Author

N70-30491# Wisconsin Univ., Madison. Dept. of Statistics.

ASYMPTOTICALLY OPTIMAL TESTS IN MARKOV PROCESSES

Richard A. Johnson and George G. Roussas Jul. 1969 40 p refs
(Grants AF-AFOSR-1789-69; NSF GP-11690)
(AD-702114; UWIS-DS-69-191; TR-191) Avail: CFSTI CSCL 12/1

Dimensional vectors are defined in terms of random variables for certain truncated versions of k-dimensional Euclidean space. An open subset of the k-dimensional Euclidean space and a discrete time parameter real-valued Markov process are also defined on the probability space with initial and transition distributions respectively. Some concrete statistical applications are presented for the real-valued parameter case. Asymptotically most powerful tests for testing the hypothesis against one sided alternatives are constructed. An asymptotically most powerful unbiased test for testing the same hypothesis against two sided alternatives is also constructed.
J.M.C.

N70-30505# Michigan Univ., Ann Arbor.

ROTATION OF PLANE QUASICONFORMAL MAPPINGS

G. D. Anderson and M. K. Vamanamurthy [1970] 20 p refs
(Grants NSF GP-8760; NSF GP-7234)
Avail: Issuing Activity

A pair of quasiconformal mappings in space are illustrated, obtained by rotating two important plane quasiconformal mappings. Examples are given to show that such mappings need not be quasiconformal in space, even if the plane mapping is extremal. A simple sufficient condition is provided showing a space mapping obtained by rotation from a plane quasiconformal mapping be quasiconformal, and this condition is shown to hold in each of the rotation theorems presented.
Author

N70-30514# Comitato Nazionale per l'Energia Nucleare, Rome (Italy). Lab. Fisica Nucleare Applicata.

MATHEMATICAL REPRESENTATION OF THE HARD CORE IN THE HAMILTONIAN FORMALISM

F. Palumbo [1969] 15 p refs
(RT/FI(69)39) Avail: CFSTI

The hard core is replaced by a singular surface potential. This replacement does not change the eigenvalues nor the eigenfunctions out and on the boundary of the cores. Nevertheless

in general the eigenfunctions do not vanish inside the cores. If the admissible solutions are restricted to twice continuously differentiable functions (but of course on the boundary of cores), the surface potential plus an appropriate soft core ensure the vanishing of the wave functions inside the cores. **Author**

N70-30527# Nottingham Univ. (England). Dept. of Geography.
COMPUTER APPLICATIONS IN THE NATURAL AND SOCIAL SCIENCES, NO. 6: MULTIPLE DISCRIMINANT ANALYSIS
P. M. Mather Dec. 1969 29 p
(MDA/PMM/1/69) Copyright. Avail: Issuing Activity 7s

Multiple discriminant analysis is used to determine the minimum number of dimensions (axes) required to best separate a given number of groups of entities (people, areas, objects, cases) on the basis of many variables, and place uncategorized cases in their most likely group within this framework. The computer program described in this report provides a means of testing classificatory schemes and allows subsequent observations to be easily added. ESRO

N70-30550# Nottingham Univ. (England). Dept. of Geography.
COMPUTER APPLICATIONS IN THE NATURAL AND SOCIAL SCIENCES, NO. 3: CURVE FITTINGS BY LEAST SQUARE METHODS
J. A. Dawson Aug. 1969 42 p refs
(CF/JAD/1/69) Copyright. Avail. Issuing Activity 7s

The three computer programs outlined are concerned with variations on the theme of the statistical regression of dependent on independent variables and use least squares techniques. The first program carries out two variable product-moment correlation and two variable regression procedures; the second one extends the number of independent variables and provides for a multiple regression analysis. The third program can be used to perform two dimensional polynomial regression analysis. The programs can be used to provide a sequence of programs of value in the analysis of functional interdependence. The form of the programs allows a series of data blocks to be analysed and transformations to be applied to the data. The effects of utilising standard function transformations on the regression coefficients is easily exhibited from the program output. The form of the data input in all three programs is very similar, thus increasing their value as a teaching aid. The programs form a sequence of analysis which becomes progressively more complicated as the hypothesis under test is evolved and refined. Recycling the program and transforming the data allow relatively complex statistical functions to be fitted to the data. ESRO

N70-30565# Institut fuer Schwingungsforschung, Karlsruhe (West Germany).
MEASUREMENT METHODS FOR STATISTICAL MAGNITUDES. STATE AND OUTLOOK [MESSMETHODEN FUER STATISTISCHE KENNGROESSEN. STAND UND AUSBLICK]
H. Baur *In* Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 87–92 refs In GERMAN (See N70-30551 15-34)
Avail: CFSTI

A survey is given of possible applications of the theory of stochastic processes to industrial environments e.g. analog-digital techniques, digital computers, etc. ESRO

N70-30587# Saarland Univ., Saarbrucken (West Germany). Inst. fuer Wirtschafts- und Sozialforschung.
FINITE TWO-PERSON COMPETITION GAMES [UEBER ENDLICHE ZWEIPERSONEN-KONKURRENZ-SPIELE]
Otto Opitz (Ph.D. Thesis 14 Feb. 1969) 1968 141 p refs In GERMAN
Avail: CFSTI

Two-person mathematical games with the partners in a highly competitive situation, which is a more general case than the zero-sum condition, were treated. The extent to which these two-person competition games are solvable was investigated, i.e. how far the solution theory for two-person zero-sum games may be transferred to this type of game. ESRO

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N70-29214# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
STABILITY OF A SLOPING INTERFACE IN A ROTATING TWO-FLUID SYSTEM
Desiraju B. Rao and T. J. Simons Nov. 1969 40 p refs *Its* Atmospheric Sci. Paper No. 151
(Contract F19628-68-C-0104; Grant NSF GA-11637)
(AD-700429; SR-2; AFCRL-69-0540) Avail: CFSTI CSCL 4/2

When two incompressible homogeneous fluids in relative motion are superimposed in a gravitationally stable configuration and are subjected to rotation about a vertical axis, the interface and the free surface slope away from the horizontal. Such a system possesses rotational modes of oscillation in addition to the external and internal gravitational modes. The dynamic stability of small amplitude motions superimposed on this system studied. For unstable modes, the values for the phase speed and the growth rates are presented as a function of wavelength of the perturbations and shear of the basic flow. In particular, it was shown that the instability occurs in this model as a result of an interaction between an internal gravitational mode and a rotational mode. **Author (TAB)**

N70-29258# Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
RAIN SCAVENGING STUDIES
Dec. 1969 97 p
(Contract AT(11-1)-1407)
(COO-1407-33; PR-6) Avail: CFSTI

The field project was moved from Chickasha, Oklahoma, to Clinton, Illinois. The instruments were installed at Clinton and the measurement and sampling of rain data were coordinated with collaborators at Clinton during the period May 16 to June 15, 1969. Data obtained were sparse, and opportunity for good tracer experiments using indium flares did not appear because of a severely dry season in central Illinois. Illinois. Data obtained are presented in the form of tables, graphs, weather maps, and radar photographs. Measurements of the particle size distribution of the flare-generated indium tracer have given a bimodal curve. Calibration of the drop-size spectrometer has been repeated. **NSA**

N70-29262* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE WIND FIELD
J. R. Scoggins *In* AGARD Wind Effects on Launch Vehicles Feb. 1970 p 33–74 refs (See N70-29260 15-31)
Copyright. Avail: Issuing Activity

A fairly condensed and quantitative description of the characteristics of the wind field is given, illustrated with sufficient examples to show the type of statistical material available and to give some feel for the magnitudes included. The synthetic design profile which was used for the bulk of the Saturn vehicle development work is discussed in detail. Other approaches for the representation of the wind field and operational usage of wind data are sketched. **Author**

N70-29289# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

INCREASING THE ACCURACY OF RADAR MEASUREMENT OF PRECIPITATION

V. V. Kostarev et al 5 Nov. 1969 16 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 7, 1969 p 102 106
(Contract NOw-62-0604-c)
(AD-700360; APL-CLB-3-T-615) Avail: CFSTI CSCL 4/2

A method is proposed for measuring precipitation over an area by means of a two-wave radar operating with a wave of 0.86 cm and a wave weakly attenuated in precipitation. For precise operational determination of the quation coupling the radar reflectivity and the intensity of the precipitation, data are used on the relative attenuation of the readiowaves. An experimental check of the measurement method with the MRL-1 meteorological radar set has confirmed the advantages of the method. Author (TAB)

N70-29320# Joint Publications Research Service, Washington, D.C.

METEOROLOGY

In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 225 20 Mar. 1970 p 8-19 refs (See N70-29318 15-34)
Avail: CFSTI

Problems involved in atmospheric physics, climatology, and applied meteorology are discussed in terms of the agroclimatic resources of the U.S.S.R. Topics include: light scattering in the Earth's atmosphere, climatology, Carpathian meteorology, satellite meteorology, and thermal phenomenon in a tropical hurricane. F.O.S.

N70-29329# Joint Publications Research Service, Washington, D.C.

METEOROLOGY

In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 222 27 Feb. 1970 p 7-21 refs (See N70-29327 15-34)
Avail: CFSTI

Meteorological data processing, orbiting weather satellite, and automatic weather stations are discussed, as well as a book review concerning atmospheric turbulence, atmospheric aerosol study methods, and spectral transparancy method for humidity determination. Abstracts of other meteorological literature are also included. J.A.M.

N70-29335# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF THE BOUNDARY LAYER OF THE ATMOSPHERE WITH THE HELP OF HELICOPTERS AND GLIDERS

P. A. Vorontsov et al Oct. 1968 65 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 189, 1966 p 3-37
(AD-685493; FTD-MT-24-272-68) Avail: CFSTI CSCL 4/1

Contents: U. S. board on geographic names transliteration system; Designations of the trigonometric functions; The contemporary state of experimental investigations of mountain lee waves and certain recommendations for their diagnosis and forecast; Towards an investigation of atmospheric turbulence with the help of gliders. TAB

N70-29338# Joint Publications Research Service, Washington, D.C.

METEOROLOGY

In its Soviet Bloc Res. in Geophys. Astronomy, and Space, No. 222 16 Feb. 1970 p 11-28 refs (See N70-29336 15-34)
Avail: CFSTI

Abstracted meteorological and solar activity data are presented. Radiosonde observations, radiometers, radio emission and absorption of cloudy atmosphere, and plans for completed hydrometeorological observatory are topics summarized. Other topics included are: theory of fluctuations of the earth's atmosphere, methods for measuring lower cloud boundary, variation in duration of meteorological cycles, spectral transparancy, and use of surface active substances for modifying cumulus clouds. J.M.C.

N70-29363 National Lending Library for Science and Technology, Boston Spa (England).

SEASONAL AND SECULAR CHANGES IN THE GEOGRAPHICAL POSITION OF THE SIBERIAN HIGH

I. V. Maksimov et al 28 Nov. 1969 13 p refs Transl. into ENGLISH from Izv. Vses. Geogr. Obshch. (USSR), v. 101, no. 4, Jul-Aug. 1969 p 320-330
(NLL-M-7983-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

The seasonal and secular variations of intensity and position of the Siberian high were studied by determining the geographical coordinates and pressure of the center. USA Weather Bureau charts of the mean monthly sea level pressure for the northern hemisphere from 1899 to 1965 were used. The center was taken as the midpoint of the geometrical outline of the principal isobar. The mean coordinates of the center for the period studied are 48.4 deg N. and 94.7 deg E. The highest pressure occurs in December to February, and in exceptional years reaches 1047 mb, with an average high pressure of 1035 mb. In summers the high is nonexistent. It is concluded that the intensity of the Siberian high results from both terrestrial and cosmic factors. F.O.S.

N70-29368# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technolgoy Div.

THE DEVELOPMENT OF EARTH SCIENCES IN THE USSR, VOLUME 3 (SELECTED ARTICLES)

A. P. Vinogradov Jan. 1969 178 p refs Transl. into ENGLISH from the Russian
(AD-685525; FTD-MT-24-291-68-Vol-3) Avail: CFSTI CSCL 8/7

Contents: Atmosphere; (Formation of the Soviet school of dynamic meteorology, methods of weather forecasting, meteorological investigation of the atmosphere, radiant heat exchange and structure of the atmosphere, investigations in the field of atmospheric optics, physics of clouds and precipitation, the problem of controlling atmospheric processes): Circumterrestrial space: (The results of the investigation of circumterrestrial space). TAB

N70-29372 National Lending Library for Science and Technology, Boston Spa (England).

SECULAR VARIATIONS OF THE GEOGRAPHICAL POSITION AND INTENSITY OF THE AZORES HIGH FROM 1899 TO 1951

I. V. Maksinov et al 28 Nov. 1969 6 p refs Transl. into ENGLISH from Glav. Uprav. Gidromet. Sluzh., Met. Gidr. (Leningrad), no. 8, 1961 p 92-93
(NLL-M-7954-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

The positions and intensities of atmospheric centers of action affect the features of atmospheric circulation in different regions of the globe, with immediate consequences for weather and climate. Analysis of the position and intensity of the Azores high, made from charts of monthly mean air pressure at sea level, shows that during the period 1900 to 1950 the movement of the Azores high was distinguished by a regular secular northward drift. During the same period the position and depth of the Iceland low showed a secular southward drift. The movement of both atmospheric centers of action is caused by the effects of solar activity, their movement being opposite because of their location in different latitude zones. Comparison with the 11-year secular variations of solar activity shows that the intensities of the two atmospheric centers of action decrease as solar activity increases. R.B.

N70-29434# Joint Publications Research Service, Washington, D.C.

METEOROLOGY

In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 224 11 Mar. 1970 p 8–18 refs (See N70-29432 15-34)
Avail: CFSTI

Abstracts presented include material on long range weather forecasting, hydrologic forecasting using analog computers, use of Minsk 22 computer to predict the path of typhoons, a barotropic nonlinear atmospheric model for a hemisphere with allowance for large-scale compressibility, determining atmospheric aerosol structure by spectral transparency method, heating of ozonosphere during solar activity periods, and spectral absorption of infrared radiation by ozone. The support given to marine navigators by the hydrometeorological service is discussed. E.C.

N70-29472# Space Research Inst., Inc., North Troy, Vt.

CLOUD EXPANSION IN THE UPPER ATMOSPHERE Final Technical Report

Stuart A. Gordon Griffiss AFB, N.Y. RADC Jan. 1970 74 p refs
(Contract F30602-68-C-0231)
(AD-701044; SRI-R-30; RADC-TR-69-446) Avail: CFSTI CSCL 4/1

Seven successful flights have been made from Barbados, W.I., using gun-launch techniques. Point-releases of liquids and particles have been made at a nominal 120 km altitude to determine the rate of dispersal of particulate clouds at these altitudes. It has become apparent that at this altitude significant differences exist between point-releases and the more common trail-releases. These differences have been explored and an attempt has been made to relate the observed rate of growth of the luminous cloud, with the known thermodynamics and aerodynamics of the situation. While it was possible to explain point-release behavior in the light of standard physical processes, the trail-production mechanism is not nearly as clear. It proved possible by means of radar and visual observations to determine the rate of spreading of radar chaff and of a fine aluminum slurry whose radial motion was imparted by the vapor-pressure of the release liquid. These rates were slow and uniform and in reasonable agreement with each other. It is concluded that dispersal by an evaporating liquid is a workable technique which produces uniform densities within the cloud. The techniques developed are adequate to measure these densities and spreading rates with good precision. Author (TAB)

N70-29487*# United Aircraft Corp., East Hartford, Conn.

RESEARCH ON INSTABILITIES IN ATMOSPHERIC FLOW SYSTEMS ASSOCIATED WITH CLEAR AIR TURBULENCE

James W. Clark, Richard C. Stoeffler, and Paul G. Vogt Washington NASA Jun. 1970 71 p refs
(Contract NASw-1582)
(NASA-CR-1604; H910563-9) Avail: CFSTI CSCL 04B

Analytical and experimental fluid mechanics investigations were conducted to investigate instabilities in atmospheric flow systems associated with clear air turbulence. Most of the experimental program was directed toward investigation of the stability of straight, stratified shear flows. The results of the fluid mechanics investigations were then applied in an investigation of atmospheric shear flows. Aircraft radiosonde data were used in analyses of two cases in which stratospheric clear air turbulence was associated with mountain lee waves. The analyses appear to confirm that very stable layers in the atmosphere can be destabilized by increases in shear which occur as the layers flow through lee waves. This phenomenon can occur at all altitudes and is not limited to mountain lee wave conditions. It can be associated with shear-gravity waves that occur when there is a major inversion and strong wind shear; it can also occur when stable layers flow over the tops of large cumulonimbus clouds. Thus, the phenomenon could be responsible for an appreciable fraction of clear air turbulence encounters. Author

N70-29508# Weather Bureau, Salt Lake City, Utah. Scientific Services Div.

PRECIPITATION PROBABILITIES IN THE WESTERN REGION ASSOCIATED WITH SPRING 500-mb MAP TYPES

Richard P. Augulis Jan. 1970 80 p refs
(PB-189434; ESSA-TM-WBTM-WR-45-2) Avail: CFSTI CSCL 04B

Precipitation probabilities associated with spring 500-mb map types were generated. The spring season consisted of 947 maps for 0000 and 1200GMT March 1962-1966, April 1962-1967, and May 1962-1967. Climatologies for 12-hour precipitation were calculated for the same station network in the Western Region. Maps of spring type climatologies along with associated type and pure mean map are given. USGRDR

N70-29509# Weather Bureau, Salt Lake City, Utah.

PRECIPITATION PROBABILITIES IN THE WESTERN REGION ASSOCIATED WITH FALL 500-mb MAP TYPES

Richard P. Augulis Jan. 1970 70 p refs
(PB-189435; ESSA-TM-WBTM-WR-45-4) Avail: CFSTI CSCL 04B

Precipitation probabilities associated with fall 500-mb map types were generated. The fall season consisted of 1170 maps for 0000 and 1200GMT September 1962-1968, October 1962-1968, and November 1961-1967. Climatologies for 12-hour precipitation were calculated for the same station network in the Western Region. Maps of fall type climatologies along with associated type and pure mean map are given. USGRDR

N70-29525# Sandia Corp., Albuquerque, N.Mex. Test Effects Dept.

CLIMATOLOGY OF AIRBLAST PROPAGATIONS FROM NEVADA TEST SITE NUCLEAR AIRBURSTS

Jack W. Reed Dec. 1969 123 p refs
(SC-RR-69-572) Avail: CFSTI

Microbarograph data from Nevada atmospheric nuclear tests of 1951 to 1962 have been assembled to show climatological patterns for long range propagations. Amplitudes have been normalized to 1-kiloton yield, free-airburst, after actual height-of-burst effects were removed. On-site propagations under early morning inversions often showed double the amplitudes expected for standard hemispherical wave expansion. These enhanced blasts were blocked by mountains and did not penetrate off-site. Strong winds at higher altitudes gave as much as 5× blast magnifications at Indian Springs and Las Vegas. Ducting at very high altitude, to 30 miles or 150,000 feet, is seasonally directed eastward in winter, westward in summer. Resulting amplitudes in the sound ring near 135 miles range show as large as 3× magnification downwind and 0.006× reduction upwind. Author (NSA)

N70-29550# Colorado State Univ., Fort Collins. Natural Resources Center.

CONTROLLED ACCUMULATION OF BLOWING SNOW: ATMOSPHERIC WATER

J. L. Rasmussen 13 Jun. 1969 16 p Sponsored by Dept. of Interior
(PB-189783) Avail: CFSTI CSCL 08L

An experiment designed to trap falling snow and control drifting snow over the high alpine regions of the Colorado Rocky Mountains is described. The experiment is based on the fact that a wind shift occurs following many snow occurrences over this region and a fence system was developed to act both as a trap for falling snow and as a channelling mechanism to control drifting snow. The report describes various fence designs that were tested and provides photographic evidence of the fence system's influence on the blowing snow. The system was effective in increasing the volume of snow in the target region but the density of snow in the controlled drift was found to be only eighty percent of the density in adjacent natural drift. Author (USGRDR)

N70-29667# California Univ., Davis. Dept. of Water Science and Engineering.

RADIATION DATA AND ANALYSES FOR THE 1966 AND 1967 MICROMETEOROLOGICAL FIELD RUNS AT DAVIS, CALIFORNIA

D. L. Morgan, W. O. Pruitt, and F. J. Lourence Fort Huachuca, Ariz. ECOM Feb. 1970 54 p refs
(Grant DA-AMC-28-043-68-G10)
(AD-702236; ECOM-68-G10-2) Avail: CFSTI CSCL 4/1

The report presents basic radiation data gathered at the University of California at Davis during nine intensive micrometeorological data-gathering periods in 1966 and 1967. A comparison is made between measurements of the total incoming solar radiation taken with an Eppley pyranometer and the combination of two components of incoming solar radiation measured by a tracking pyrheliometer and a shaded pyranometer, respectively. The results indicate relatively small differences between the sums of the components and the measured totals giving a high degree of confidence in these data. Two independent checks of the measured net radiation, a key in energy balance consideration, are made. A comparison of measured net radiation with the proper combination of other measured radiation components, the first independent check, shows very close agreement between the two for both clear- and cloudy-sky conditions. The second method of checking the measured net radiation, incorporating an estimate of the longwave atmospheric radiation, agrees closely for clear-sky periods but underestimates the measured net radiation for cloudy conditions. Various methods of estimating atmospheric radiation including the use of radiation charts and six empirical formulae are examined. Author (TAB)

N70-29691# New York Univ., N.Y. Geophysical Sciences Lab.

SPECIFICATION OF THE WIND DISTRIBUTION IN THE MARINE BOUNDARY LAYER FOR WAVE FORECASTING

Vincent J. Cardone Dec. 1969 147 p refs
(Contracts Nonr-285(57); N62306-68-C-0249)
(AD-702490; GSL-TR-69-1) Avail: CFSTI CSCL 4/2

The operational application of sophisticated spectral ocean wave specification models to wave forecasting requires that an adequate meteorological input to these models consist of a specification of the wind distribution in the marine surface boundary layer. This study demonstrates how this requirement can be satisfied in a computerized objective format from routinely available meteorological data and prognostic fields. Wave generation theory is employed to develop a quantitative formulation for the effects of atmospheric stability upon the development of the wave spectrum. In terms of this stability dependent spectral growth formulation, the effects of stability on wave generation are found to be significant and compare well with observational studies of the dependence of wave height and white-cap production on air-sea temperature difference. A simple model of the non-neutral, baroclinic planetary boundary layer over a sea surface described in terms of an internally prescribed roughness parameter is derived. The model is shown to provide a suitable framework for the diagnosis of the marine surface boundary layer wind distribution from prognostic fields of sea level pressure, air temperature and sea surface temperature. Author (TAB)

N70-29741*# Texas Univ., El Paso. Shellenger Research Labs.

EXPERIMENTAL INTERAMERICAN METEOROLOGICAL ROCKET NETWORK (EXAMETNET) DATA REPORT SERIES Annual Report, 1968

Washington NASA 1970 184 p refs Sponsored by NASA
(NASA-SP-231) Avail: CFSTI CSCL 04B

EXAMETNET meteorological rocket launchings and data dissemination are conducted synoptically from launch sites at Chamical and Mar Chiquita, Argentina; Natal, Brazil; and Wallops Island, Virginia. The reduced data from the launchings for each quarter are checked, further reduced, compiled, and published in the EXAMETNET data report series. These network data reports, after being reviewed and edited by all participants of the EXAMETNET, are then compiled into the annual publication for broad dissemination. This annual publication for the year 1968 contains the meteorological rocket observational data acquired by each participant. Appendixes concerning related activities of the EXAMETNET are also included. The appendixes describe the data and some of the technical and scientific activities of EXAMETNET and participants, and in addition, list all EXAMETNET and related publications. Author

N70-29804# Army Electronics Command, Fort Monmouth, N.J.

ANALYSIS OF SURFACE ATMOSPHERIC ELECTRIC POTENTIAL GRADIENT OBSERVATIONS, APRIL–OCTOBER 1968

James C. Kline, Emily M. Frisby, and William C. Barr Dec. 1969 25 p refs
(AD-700956; ECOM-3208) Avail: CFSTI CSCL 4/1

The report is a summary review of surface atmospheric electricity measurements made between April and October 1968 at two sites in New Jersey. It discusses seaside and inland site values under varying meteorological conditions, attempts to establish diurnal variations for the Evans Area, Belmar, New Jersey, and relates the findings of the 1968 summer and fall season in New Jersey to those of other researchers in the field of atmospheric electricity. Author (TAB)

N70-29816# Syracuse Univ. Research Corp., N.Y.

DESCRIPTION OF COMPUTER PROGRAMS FOR THE ANALYSIS AND PRESENTATION OF TRADE WINDS DATA, 1 MARCH – 15 DECEMBER 1969

Jerald Schwarz Dec. 1969 156 p ref
(Contract F19628-68-C-0209)
(AD-702530; ESD-TR-70-32) Avail: CFSTI CSCL 4/2

An investigation of the Trade Wind Duct was carried out from March 6 through March 25, 1969 in the Northern part of the Caribbean Sea. An instrumented aircraft was used to record meteorological and radio refractivity data in digitized format for computer analysis. In addition, extensive radiosonde data was included in the analysis to support the aircraft measurements and provide a basis for weather analysis. In order to assimilate, process and present such a large amount of data it was imperative that machine processing be used. The following report describes the various programs which were used in the analysis and presentation of the data. A ray-tracing program was also developed to analyze radio wave propagation in relation to Trade Wind Duct characteristics. This program has the advantage that horizontal changes in the Duct can be included. Most ray-tracing programs assume that the vertical variation of refractivity is spherically stratified. Author (TAB)

N70-29826# Stanford Univ., Calif. Dept. of Civil Engineering.

Pb-210 IN SURFACE AIR ALONG THE SLOPES OF MAUNA LAO VOLCANO, HAWAII Final Report

Paul Kruger Sep. 1969 24 p refs
(Contract AT(04-3)-326)
(SU-326-PA-16-3; SU-TR-117) Avail: CFSTI

The massive volcano Mauna Loa affects the general circulation of the trade winds. The presence of the radionuclide Pb-210 on aerosol particles has been a source of study of atmospheric chemical and transport processes. Lead-210 results from the successive decay of a series of short-lived radioactive products of Rn-222 which diffuses into the atmosphere as an isotope of the rare-gas element radon. The comparatively large values of Pb-210 concentration in Hawaii might indicate that little Pb-210 is removed from the atmosphere during the trade wind transport over the open ocean. Lead-210 and Sr-90 concentrations on aerosols were measured between July 17 to 20, 1966 and August 29 to September 1, 1967, in Hawaii, at 4 locations other than the volcano. Radon-222 concentrations were measured at the volcano and three other locations in Hawaii on August 30 and 31, 1967. NSA

N70-29827# Uppsala Univ. (Sweden). Meteorologiska Inst.
MESOMETEOROLOGICAL STUDIES OF PRECIPITATION Final Technical Report, Jul. 1968 - Jun. 1969
Tor Bergeron Aug. 1969 97 p refs
(Contract DAJA37-67-C-0881)
(AD-701948; FTR-2) Avail: CFSTI CSCL 4/2

The report concerns mesometeorological studies of precipitation with particular emphasis on selected rainfall maps from the Uppsala (Sweden) field. Overall, between the first and second reports, this project (Project Pluvius) aims to produce at least a hundred maps of daily and monthly rainfall distributions, especially for 1955-65. This, the second report contains eight monthly maps and 56 daily maps together with appropriate text explaining the method of editing the maps and a discussion of their features and general conclusions to be drawn from them. Especial military relevance is seen in these mesoscale studies, e.g. to tactical mobility operations, missile design and operations, propagation, use of weather radar, and battleground visibility. Author (TAB)

N70-29828# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CERTAIN PECULIARITIES OF VERTICAL VARIABILITY OF WIND SPEED IN THE BOUNDARY LAYER OF THE ATMOSPHERE
R. A. Pershina 3 Oct. 1969 14 p refs Transl. into ENGLISH from Tr. Nauch N.-Issled. Inst. Aeroklimatologii (Moscow), no. 52, 1968 p 93-97
(AD-700800; FTD-MT-24-249-69) Avail: CFSTI CSCL 4/1

Rawinsonde data are the basic data used in an empirical analysis of some of the characteristics of the vertical variability of wind speed in the atmospheric boundary layer. The mean and mean square deviations in wind speed were calculated for vane height (10-15m) and for h equals 0.1, 0.2, and 0.5 km above the ground and h equals 1.0, 1.5, 2.0, and 3.0 km above sea level. Interpolation equations are presented which can be used to make approximate calculations of mean wind-speed profiles and to determine their variability in the boundary layer when the mean wind speed at vane height is in excess of 3-4 m/sec. Author (TAB)

N70-29918# Miami Univ., Coral Gables, Fla. Inst. of Atmospheric Sciences.
FURTHER STUDIES ON FLOW OVER NONHOMOGENEOUS TERRAIN Final Report, Apr. 1968 - Sep. 1969
Mariano A. Estoque and Chandrakant M. Bhumralkar Fort Huachuca, Ariz. ECOM Nov. 1969 48 p refs
(Grant DA-AMC-28-043-68-G9)
(AD-701917; ECOM-68G9-F) Avail: CFSTI CSCL 4/2

A method for solving the non-linear three-dimensional steady-state equations which govern planetary boundary layer flow is described. The method is applicable to air motions over terrain with horizontally varying surface roughness, temperature and moisture. It can also be applied to a physical system consisting of the air and the sea (or earth) boundary layers taken together. Examples of calculations for selected cases of terrain variations are presented. Convergence of method has been assessed by determining the degree to which the solutions satisfy the set of equations. The results of the calculations show that the method produces qualitatively realistic distributions of the different meteorological variables. Author (TAB)

N70-29935# Texas A&M Univ., College Station.
A NUMERICAL TECHNIQUE FOR THE DETERMINATION OF THE PRESSURE DISTRIBUTION IN THE PRESENCE OF CONVECTIVE MOTION
Robert L. Croft Fort Monmouth, N.J. ECOM May 1969 72 p refs
(Contract DAAB07-68-C-0073; Proj. Themis)
(AD-701912; Ref-69-6-T; ECOM-0073-T; TR-1) Avail: CFSTI CSCL 4/2

Numerical simulation of atmospheric convection in many instances will require the solution of a diagnostic equation to determine the pressure distribution. This relationship, called the balance equation, is elliptic and hence subject to solution by relaxation or iterative techniques. However, these methods have failed to give the degree of accuracy which is required to carry out other steps in the simulation procedure. An alternate and quite general technique is developed which is based upon a matrix transformation procedure given by Polozhii (1965). This transformation method readily can be adapted to various boundary conditions, grid spacings, and finite-difference formulations although the discussion primarily is concerned with a case of derivative boundary conditions and non-uniform grid. A proof is given of the existence of a numerical solution when the transform method is applied to a two-dimensional balance equation. The accuracy of the method is tested by application to two cases for which the correct distributions of pressure are known. An extension of the transform method to a solution of the balance equation over a three-dimensional region is outlined. A computer routine for solving the two-dimensional problem is described. Author (TAB)

N70-29952# Army Electronics Command, Fort Huachuca, Ariz. Atmospheric Sciences Lab.
BROOKS' TWO-STEP FUNCTION FOR THE DIABATIC WIND PROFILE: A FORTRAN 4 PROGRAM
Ernest B. Stenmark Dec. 1969 39 p refs
(AD-701915; ECOM-6049) Avail: CFSTI CSCL 4/2

A computer program for least-squares fitting of Brooks 2-step diabatic profile function to experimental micrometeorological data was developed. Results of fitting the Brooks function to three sets of data are compared to results obtained from fitting a simple log-plus-linear function to the same data. The Brooks function is shown to fit the data as well as, or better than, the log-linear function, and is also shown to avoid the problem of function-induced curvature at the top of the profile. Author (TAB)

N70-29956*# Space Data Corp., Phoenix, Ariz.
A STUDY OF 30 km TO 200 km METEOROLOGICAL ROCKET SOUNDING SYSTEMS, VOLUME 1. PART 2: LITERATURE AND DATA REVIEW
Bruce Bollerman Washington NASA May 1970 450 p refs
(Contract NAS8-20797)
(NASA-CR-1529-Pt-2) Avail: CFSTI CSCL 04B

Contemporary literature on meteorological rockets and associated systems is reviewed to determine the accuracies and limitations of the current meteorological rocket systems from available data, and to determine the adaptability of the more complex geophysical rocket experiments to simplified, economical, routine meteorological rocket soundings. The review covers the various system requirements and techniques used in obtaining meteorological measurements of the 30 km to 200 km region of the atmosphere. In addition to the detailed descriptions of the various rocket vehicles, telemetry, sensors, decelerators and other related equipment, the review also includes a study of the gun probe systems. Author

N70-29999*# Chicago Univ., Ill. Dept. of Geophysical Sciences.
BASIC PROBLEMS ON CLOUD IDENTIFICATION RELATED TO THE DESIGN OF SMS-GOES SPIN SCAN RADIOMETERS

Tetsuya Theodore Fujita Mar. 1970 37 p refs *Its* SMRP Res. Paper No. 84
(Grant NGR-14-001-008)
(NASA-CR-110352) Avail: CFSTI CSCL 04B

To determine design criteria for future geostationary satellites, meteorological input based upon up-to-date knowledge of nephsystems is considered. The subjects discussed are; horizontal resolution, picture intervals and areas, and brightness and radiance enhancement. Unbiased recommendations are made based upon meteorological evidences obtained as of January 1970. Author

N70-30028# Finnish Meteorological Office, Helsinki.
METEOROLOGICAL YEARBOOK OF FINLAND. VOLUME 68, PART 1b: CLIMATOLOGICAL DATA FROM JOKIOINEN AND SODANKYLAE OBSERVATORIES, 1968 [SUOMEN METEOROLOGINEN VUOSIKIRJA. NIDE 68, OSA 1b: JOKIOISTEN JA SODANKYLAEN OBSERVATORIOIDEN ILMASTOHAVAINNOT, 1968]
1969 50 p refs In ENGLISH and FINNISH
Avail: CFSTI

The results of observations made by the meteorological observatories of Jokioinen and Sodankylä in 1968 are presented. The values obtained from recordings of atmospheric pressure, temperature, relative humidity, wind direction and speed at even hours are given with the amount of sunshine and cloud, including cloud formation and height, hydrometeors observed with time of appearance, visibility and precipitations. Author

N70-30043# Aktiebolaget Atomenergi, Studsvik (Sweden).
ATMOSPHERIC DIFFUSION: INVESTIGATIONS AT STUDSVIK AND AGESTA, 1960 – 1963
L-E. Haeggblom, Ch. Gyllander, and U. Widemo Dec. 1969 96 p refs
(AE-379) Avail: CFSTI

Data from the extensive research program concerning the diffusion behavior in air are presented in graphs and tables. Values for diffusion parameters and the resulting concentration-distribution in plumes are shown for different weather conditions during a release period of 1 h, for stack heights of 25, 50, 75, and 100 m and for release at ground level. The method and calculation principles are described, and different factors such as the stability parameter, the effect of the stack and the width of the plume are presented. The data is also used for calculating release from buildings and for diffusion for short sampling periods. Author

N70-30051# Danish Meteorological Inst., Charlottenlund.
SELECTED SUMMARIES ON THE CLIMATE OF THE FAEROE ISLANDS: MAIN OBSERVATION BASES DURING NORMAL PERIODS FROM 1931 TO 1960 AND PART OF OBSERVATIONS FOR A SHORT YEARBOOK [FORELOEBIG OVERSIGT OVER KLIMAET PA FAEROEERNE: HOVEDSAGELIG BASERET PA OBSERVATIONER I NORMALPERIODEN 1931 – 1960 OG PA EN DEL OBSERVATIONER FRA ET KORTERE AREMAL]
Leo Lysgaard 1969 32 p In DANISH
(Rept-20) Avail: CFSTI

A general summary of weather and climate conditions is given for various points on the islands. Tabular data are listed for maximum, minimum, and average monthly observations of atmospheric pressure, wind velocity and intensity, frost and ice cover, precipitation, and relative humidity. Isobar levels obtained from radiosonde data are also given for monthly maximums, minimums, and average during the period 1961 to 1965. Transl. by R.B.

N70-30076*# GCA Technology Div., GCA Corp., Bedford, Mass.
ANALYSIS OF LOWER ATMOSPHERIC DATA FOR DIFFUSION STUDIES
F. A. Record, R. N. Swanson, H. E. Cramer, and R. K. Dumbauld Apr. 1970 138 p refs
(Contract NAS8-30503)
(NASA-CR-61327; GCA-TR-69-15N) Avail: CFSTI CSCL 04B

Mathematical diffusion models are described for estimating toxic fuel hazards at Kennedy Space Center and requisite meteorological inputs for the models are developed by analysis of measurements made previously. The diffusion models are adjustable for initial cloud dimensions near the source and source emission time and are generally applicable to all source types. The basic model format is similar to the conventional Gaussian plume equation. Additional terms were added to account for the effects on cloud growth of the depth of the mixing layer and vertical wind shear, and for cloud depletion by decay, precipitation scavenging, and gravitational settling. Subsets of equations are developed for calculating buoyant plume rise caused by the liberation of thermal energy at the source. Although the models are of the steady-state type, provision is also made to accommodate simple step changes in atmospheric structure at arbitrary travel distances or travel times downwind from the source. Author

N70-30081# Bureau of Meteorology, Melbourne (Australia).
AUSTRALIAN CLIMATOLOGICAL SUMMARY: UPPER AIR DATA, OCTOBER 1969
Oct. 1969 17 p refs
Avail: CFSTI

The statistics are derived from upper atmosphere wind, temperature and humidity observations made daily. International identification number of the observation station and station name are given, along with nominal time (GMT) of observation, which spans a time interval of an hour or longer. Author

N70-30087# Weapons Research Establishment, Salisbury (Australia).
UPPER ATMOSPHERE TEMPERATURES FROM GRENADE GLOW CLOUDS USING AN ECHELLE SPECTROGRAPH WITH IMAGE INTENSIFIER
R. G. Roper and C. H. Low Nov. 1969 60 p refs
(WRE-TN-HSA-161) Avail: CFSTI

An Echelle spectrograph with image intensifier is applied to temperature profile measurements from 150 to 250 km above Woomera, at morning and evening twilight, on May 31, 1968. The aluminum monoxide band spectra of aluminized grenades released by Skylarks SL761 and SL762 was recorded. The spectrograph, which has a resolution of 0.73 A, resolved the rotational line structure of the resonance radiation from AlO molecules. Author

N70-30131# National Environmental Satellite Center, Washington, D.C.
MAPPING OF GEOSTATIONARY SATELLITE PICTURES: AN OPERATIONAL EXPERIMENT
R. C. Doolittle, C. L. Bristor, and L. Lauritson Mar. 1970 45 p refs
(ESSA-TM-NESCTM-20) Avail: CFSTI

Spin scan cloud pictures from the ATS-1 geostationary satellite were mapped for daily operational experimental use during the period from June to December 1969. The details of this continuing experiment are discussed. Computer programs are used, first to preprocess the digitized image data to produce a geometrically normalized picture, then to map the normalized image on Mercator or polar stereographic projections. Author

N70-30179# Naval Postgraduate School, Monterey, Calif.
A RECENT IMPROVEMENT IN THE NAVY'S NUMERICAL-STATISTICAL SCHEME FOR FORECASTING THE MOTION OF HURRICANES AND TYPHOONS
R. J. Renard, M. J. Daley, and S. K. Rinard 10 Jan. 1970 29 p refs
(AD-700327; NPS-51RD0011A) Avail: CFSTI CSCL 4/2

The Navys numerical-statistical scheme for forecasting the motion of tropical cyclones is reviewed. The numerical component (HATRACK) represents geostrophic steering of the cyclone by the Fleet Numerical Weather Centrals smoothed isobaric height fields at 1000, 700, and 500 mb. The statistical component refers to the correction for bias in the numerical steering. The paper introduces an improvement in application of the statistical correction for bias. The enhanced scheme, MODIFIED HATRACK, is applied to forecasts of all named North Atlantic tropical cyclones in 1967 and 1968 and to a select number of 1967 North Pacific tropical storms and typhoons. The accuracy of MODIFIED HATRACK is found to excel the official forecast and that of the National Hurricane Centers NHC-67 technique for all forecast intervals through 48 hours. MODIFIED HATRACK errors range from an average of 40 nautical miles at 12 hours to 240 nautical miles at 48 hours. Such figures represent a 60 percent and a 10 percent reduction in errors, respectively, compared to official forecasts in the Atlantic. For the Pacific, the error reductions are of the order of 15 percent.
Author (TAB)

N70-30253# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

TRANSACTIONS OF THE MAIN GEOPHYSICAL OBSERVATORY, LENINGRAD (SELECTED ARTICLES)

K. Ya. Kondratev et al Nov. 1968 189 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 196, 1966 p 1-140
(AD-684374; FTD-MT-24-256-68) Avail: CFSTI CSCL 4/2

Contents: Determination of temperature of the underlying surface and clouds from meteorological earth satellites; Certain results of measurements of albedo of laminar clouds in the spectral region of 8-12 um; Vertical distribution of longwave ascending flux; Degrees of blackness of clouds of upper and middle strata; The question of determination of temperature of the soil surface from air temperature; Parameterization of television images of clouds on digital computers; Investigation of intramass variability of atmospheric aerosol; Annual variation of vertical transparency of the atmosphere; Experimental investigations of spectral brightness characteristics of clouds, atmosphere, and underlying surface in interval of wavelengths at 0.3-2.5 um; On the possibility of tracking clouds on the shady side of earth from meteorological satellites.
TAB

N70-30285# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ON THE PROBLEM OF THE SETTLING OF AN ARTIFICIAL AEROSOL CLOUD IN THE ATMOSPHERE

A. N. Miroshkina et al 3 Nov. 1969 8 p refs Transl. into ENGLISH from Tr. Inst. Prikl. Geofiz. (Leningrad), no. 4, 1967 p 41-47
(AD-703172; FTD-MT-24-302-69) Avail: CFSTI CSCL 13/2

An analysis is made of data obtained to determine the rate of settling, the movement along trajectories and the positions, extent, and distance from the source of surface concentration maxima of artificial aerosol clouds. The aerosol used consisted of luminescent particles of polymethylmethacryllate released into the atmosphere at various speeds and in various weather conditions. Analysis of these data indicates the following: for finely dispersed particles, introduced into the atmosphere in small concentrations or under experimental conditions in which the initial interaction of the particles with the atmosphere ceases almost immediately, the surface fallout concentration is maximum at a distance from the source and depends on the vertical coefficient of particle dispersion, when the initial volume of particles discharged is large, especially those dispersed from aircraft into an unstably stratified atmosphere, the surface concentration maximum is much closer. If the aerosol cloud settles fast enough, a second surface concentration maximum does not occur.
Author (TAB)

N70-30377# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

TRANSACTIONS OF THE LENINGRAD INSTITUTE OF APPLIED GEOPHYSICS, NO. 10: SELECTED ARTICLES

G. B. Mashkova et al 30 Jan. 1970 20 p refs Transl. into ENGLISH from Inst. Prikl. Geofiziki, Leningrad, Trudy (USSR), no. 10, 1967 p 3-17 and p 39-43
(AD-702976; FTD-HT-23-318-69) Avail: CFSTI CSCL 4/2

Contents: Characteristics of the meteorological regime in the lower 300-m layer determined from two years of observations on a high tower; Accounting for wind turbulence characteristics in the calculation of dynamic loads on high structures; Wind profiles when clouds are lower than 300 m.
Author (TAB)

N70-30378# Air Force Cambridge Research Labs., Bedford, Mass.

PRECIPITATION AND CLOUDS: A REVISION OF CHAPTER 5, HANDBOOK OF GEOPHYSICS AND SPACE ENVIRONMENTS

A. E. Cole, R. J. Donaldson, R. Dyer, A. J. Kantor, and R. A. Skrivanek Nov. 1969 54 p refs Revised Its AF Surveys in Geophys. No. 212
(AD-703288; AFCRL-69-0487) Avail: CFSTI CSCL 22/1

The need for geophysical and astrophysical information is critical for the design of aircraft, missiles, and satellites. The HANDBOOK OF GEOPHYSICS AND SPACE ENVIRONMENTS is an attempt by the U. S. Air Force to organize some of these data into compact form. The water content of the atmosphere is discussed in this chapter. Data are provided on the frequency of occurrence of various surface rates of rainfall, hail, the vertical distribution of precipitation intensity, and the particle size distribution in widespread precipitation. Information on the types and limitations of cloud data and of the distribution and water content of clouds is included.
Author (TAB)

N70-30387# Weather Bureau, Silver Spring, Md.

NUMERICAL WEATHER PREDICTION ACTIVITIES, NATIONAL METEOROLOGICAL CENTER, SECOND HALF OF 1969

Apr. 1970 53 p refs
Avail: CFSTI

Summaries are presented for work in precipitation forecast models, statistical techniques and analysis in data processing, thermodynamic models for long range numerical prediction, and verification of primitive equation model precipitation and relative humidity forecasts for the United States area.
R.B.

N70-30424# Danish Meteorological Inst., Charlottenlund.

SELECTED SUMMARIES ON THE CLIMATE OF DENMARK [FORELOEBIG OVERSIGT OVER DANMARKS KLIMA]

Leo Lysgaard 1969 109 p In DANISH
(Rept-19) Avail: CFSTI

Minimum, maximum, and normal monthly data is presented for atmospheric pressure, wind rates, air temperature, sunshine, precipitation, and relative humidity for the periods 1931 to 1960. Data are also given for midsummer and July for the periods 1921 to 1966 and 1918 to 1967.
Transl. by R.B.

N70-30430# Joint Publications Research Service, Washington, D.C.

RADAR FOR MICROSTRUCTURAL STUDIES OF CLOUDS AND PRECIPITATION

B. Kh. Tkhamokov 19 May 1970 5 p Transl. into ENGLISH from Tr. Vses. Soveshch. po Radiolokatsionnoy Meteorol. (Moscow), 1968 p 237-240
(JPRS-50540) Avail: CFSTI

The modification of hail processes and development of radar techniques permitting the detection of hail-bearing clouds and control of the modification results are discussed. The set of radar characteristics of a cloud: the vertical output of the radio echo the radar reflectivity of the clouds and precipitation, and coordinates are determined. The determination of the diameter and concentration of the hailstones in the cloud by radar techniques is discussed. The listed requirements define the schematic and the structure of radar sets used. A brief description of radar systems Grad-2 and Grad-3 is presented. Author

N70-30441# Finnish Meteorological Office, Helsinki.
METEOROLOGICAL YEARBOOK OF FINLAND, VOLUME 68, PART 1A: CLIMATOLOGICAL DATA, 1968 [SUOMEN METEOROLOGINEN VUOSIKIRJA, NIDE 68, OSA 1A: ILMASTOHAVAINNOT, 1968]
1970 92 p In FINNISH and ENGLISH
Avail: CFSTI

Tabulated climatological data from daily, monthly, and yearly observations are presented. Daily recordings were obtained from the synoptic station at Kuusamo and monthly and yearly summaries were recorded from 142 stations. J.M.C.

N70-30443# Finnish Meteorological Office, Helsinki.
METEOROLOGICAL YEARBOOK OF FINLAND, VOLUME 65-66, PART 4: MEASUREMENTS OF RADIATION AND BRIGHT SUNSHINE, 1965 – 1966 [SUOMEN METEOROLOGICALINEN VUOSIKIRJA, NIDE 65-66, OSA 4: SAETEILY- JA AURINGONPAISTE- HAVAINNOT 1965 – 1966]
1969 78 p In FINNISH and ENGLISH
Avail: CFSTI

The results obtained from the observations of radiation and sunshine made at Finnish stations during the years 1965 and 1966 are presented. Radiation measurements have been made at the following four stations: Helsinki (Ilmala), Jokioinen, Luonetjärvi and Sodankylä. The geographical coordinates and heights of the stations, the height at which the observing instruments were installed, and also the types of observing and recording instruments in use are given. The types and serial numbers of the standardization instruments used are included. The position of stations at which sunshine recordings were made; their geographical positions and heights, and the use of a heating apparatus, where fitted, are shown. Author

N70-30449# National Meteorological Center, Suitland, Md.
THE NATIONAL AIR POLLUTION POTENTIAL FORECAST PROGRAM
Edward Gross May 1970 32 p refs
(ESSA-TM-WBTM-NMC-47) Avail: CFSTI

Air Pollution Potential (APP) is definable as a measure of the inability of the atmosphere to adequately dilute and disperse pollutants emitted into it based on values of specific meteorological parameters of the macroscale features. To delineate areas on the macroscale in which high APP has the greatest probability of occurring, a stagnation index has been developed independant of mixing height and transport wind speed data. The associated stagnation conditions are usually manifested by stable stratification, weak horizontal wind speed components and little, if any, significant precipitation. The numerical and subjective means are described by which stagnation areas are delineated, mixing height and transport wind speed calculated, and how high APP conditions are transmitted to our users via facsimile and teletypewriter. Author

N70-30466# National Bureau of Standards, Washington, D.C. Building Research Div.
PERFORMANCE OF LOUVERED DEVICES AS AIR MIXERS
T. K. Faison, Jr., J. C. Davis, and P. R. Achenbach Mar. 1970 23 p refs *Its* Bldg. Sci. Ser. No. 27
Avail: SOD $0.30 Catalog No. C 3.29/2:27

As part of a study of evaluting methods for reducing thermal gradients within the cross section of an air stream, three louvered mixing devices were investigated. Each of these devices was found to be capable of reducing the cross-sectional nonuniformity of air temperature to a few percent of the entering value. The three devices covered in this report contain combinations of louvers (directing vanes) and baffles as mixing elements. The three mixers (the louvered strip, the concentric louvers, and the louvered-baffle) required 4.75, 3.8, and 3.0 duct diameters, respectively, to reach a mixing effectiveness level of 97 percent. The mixing effectiveness of the louvered strip and concentric louver models was independent of the approach velocity, whereas the effectiveness of the louver-baffle model was somewhat dependent on the approach velocity. The pressure drops accompanying air flow through the mixers, expressed as multiples of the velocity head of the entering air, were approximately 7, 5, and 38 for the louvered strip, concentric louver, and louver-baffle mixers, respectively. Author

N70-30467# Bureau of Meteorology, Melbourne (Australia).
AUSTRALIAN CLIMATOLOGICAL SUMMARY UPPER AIR DATA, SEPTEMBER 1969
Sep. 1969 17 p refs
Avail: CFSTI

Meteorological statistics of the upper atmosphere in the Australian region are provided. The statistics are derived from upper atmosphere wind, temperature, and humidity observations made daily at a number of stations. Author

N70-30474# Finnish Meteorological Office, Helsinki.
METEOROLOGICAL YEARBOOK OF FINLAND, VOLUME 68, PART 2: PRECIPITATION AND SNOW COVER DATA, 1968 [SUOMEN METEOROLOGINEN VUOSIKIRJA, NIDE 68, OSA 2: SADE-JA LUMIHAVAINNOT, 1968]
1969 97 p In FINNISH and ENGLISH
Avail: CFSTI

Daily precipitation recordings and reports on the nature of the precipitation from 120 stations are tabulated. Data from all-year stations include tables of monthly and annual precipitation, maximum diurnal precipitation, the date of the latter, the number of days with rain in excess of 0.1, 1.0 and 10.0 mm and the number with snow or sleet in excess of 0.1 mm. Four tables on snow cover giving the depth, density, and water equivalent of the snow are included. Author

N70-30482# Environmental Data Service, Silver Spring, Md.
APPLICATION OF AIR-MASS CLASSIFICATIONS TO WEST VIRGINIA CLIMATOLOGY
Robert O. Weedfall Jan. 1970 27 p refs
(ESSA-EDSTM-13) Avail: CFSTI

Percentages of various types of air masses occurring over West Virginia and their origins for the summer and winter seasons were developed in tabular form and illustrated on maps of the North American continent. Air mass percentages were largely developed from a Pennsylvania study by Landsberg, modified by Bryson's nomenclature and subjectively adjusted for West Virginia. The history of air mass classification systems are outlined, the difficulties and limitations of any type of system noted, and the various applications of recent methods are reviewed. Author

N70-30501# Smithsonian Astrophysical Observatory, Cambridge, Mass.
A METHOD FOR DETERMINING THE TOTAL REDDENING AND ABSORPTION IN THE MAGELLANIC CLOUDS
Paul W. Hodge 26 Nov. 1969 13 p refs
(SAO-Special-Rept-306) Avail: Issuing Activity

Multicolor photometry of galaxies seen behind the Magellanic Clouds is an unexploited method of further examining the total reddening and absorption in them. The method is limited by the intrinsic spread in galaxy colors, but enough galaxies are available for photometry that the gross characteristics of the absorbing layer should be detectable. A list of relatively bright galaxies recognized behind the large cloud is assembled. UBV photometry of one of the brightest of these background galaxies, NGC 2150, measured at Cerro Tololo, provides an example. Author

N70-30506*# GCA Technology Div., GCA Corp., Bedford, Mass.
HANDBOOK FOR ESTIMATING TOXIC FUEL HAZARDS Final Report
R. K. Dumbauld, J. R. Bjorklund, H. E. Cramer, and F. A. Record Apr. 1970 347 p refs
(Contract NAS8-21453)
(NASA-CR-61326) Avail: CFSTI CSCL 04B

The objective of the work was to prepare a toxic fuel hazard estimation handbook that can be conveniently used, with readily-obtainable meteorological data, to predict concentration and dosage fields downwind from primary ground-level and elevated source emissions arising from operations at Cape Kennedy. The Handbook consists principally of: (1) computer programs and instructions for the machine calculation of downwind concentration, dosage, and deposition fields; and (2) graphs, nomograms, and tables for the rapid manual estimation of ground-level concentration and dosage fields for selected sources and simplified atmospheric conditions. The handbook also includes a description of the mathematical diffusion models used, procedures for obtaining requisite meteorological inputs for the diffusion models, and worked examples for selected release modes and meteorological regimes. Much of the development of the diffusion models for use in the handbook and the formulation of procedures for the selection of meteorological model inputs were carried out concurrently. Author

N70-30549# Bureau of Meteorology, Melbourne (Australia).
AUSTRALIAN CLIMATOLOGICAL SUMMARY SURFACE DATA, SEPTEMBER 1969
Sep. 1969 52 p refs
Avail: CFSTI

Climatological statistics derived from daily observations of weather received by the Weather Records and Statistics Section of the Bureau of Meteorology are presented. The elements tabulated include: (1) pressure; (2) clouds; (3) temperature; (4) sunshine; (5) rain; (6) evaporation; and (7) wind. D.L.G.

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N70-29215# Federal Aviation Administration, Washington, D.C.
DENVER ARTCC TEST SPECIFICATIONS AND TEST PROCEDURES. NAS EN ROUTE STAGE A MODEL 2C, VERSION 1 FLIGHT DATA PROCESSING
Feb. 1970 202 p
(AD-700930) Avail: CFSTI CSCL 17/7

The report presents the guide for accomplishing the System Shakedown testing phase, Category C, for Version I Flight Data Processing (FDP) at Denver ARTCC. Version I denotes FDP without the use of the computer updating function. The Category C test effort will exercise and demonstrate the ability of the hardware, software, and personnel to perform together the flight data processing required in Version I. The total system must be proven reliable and maintainable. Additionally, scheduled and unscheduled transition procedures such as daily start up and shut down, and failure modes, will be validated during this testing effort. Author (TAB)

N70-29216# United Aircraft Corp., East Hartford, Conn. Research Labs
AIR TRAFFIC CONTROL SIMULATION MODEL EXPLORATORY STUDY Final Report
C. William Burlin Dec. 1969 52 p Sponsored by FAA
(AD-700928; UARL-H170592-1; FAA-RD-70-2) Avail: CFSTI CSCL 17/7

The problem of simulating the flow of air traffic within a large region of the continental U.S. air traffic control system using the General Purpose Systems Simulator (GPSS) computer programming language has been addressed. A simple small-scale model was developed. Results indicated that straight forward extension of the simple model would provide a useful simulation tool for air traffic control system analysis. Computer running time estimates for several large-scale problems are provided. Author (TAB)

N70-29265* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
GUIDANCE AND CONTROL
J. C. Blair and J. A. Lovingood *In* AGARD Wind Effects on Launch Vehicles Feb. 1970 p 163–197 refs (See N70-29260 15-31)
Copyright. Avail: Issuing Activity

The influence of wind upon guidance and control objectives is discussed, and then the rationale of synthesis of a control system to minimize the structural loads on a given airframe. This situation is probably typical insofar as external constraints such as schedules and manufacturing lead times will necessitate a design freeze of the structure relatively early during the development cycle, whereas the control system permits more flexibility and then will be the primary element which will be optimized. The rather short treatment of guidance reflects the fact that wind interacts with the control system in a much more pronounced way than with the guidance systems. The latter is activated only during second stage flight, when atmospheric influences are almost negligible for Saturn vehicles. Also, loads and control forces imposed by space vehicle guidance systems are generally small. The emphasis is on viewpoints and general relations rather than on numerical results. Author

N70-29421# Sud-Aviation, Toulouse (France).
INFLUENCE OF AEROELASTIC EFFECTS ON THE STUDY AND DEVELOPMENT OF DAMPING IN PITCH AND ON THE AUTOMATIC PILOT OF A SUPERSONIC TRANSPORT AIRCRAFT [INFLUENCE DES EFFETS AEROELASTIQUES SUR L'ETUDE ET LA REALISATION DE L'AMORTISSEUR DE TANGAGE ET DU PILOTE AUTOMATIQUE D'UN AVION DE TRANSPORT SUPERSONIQUE]
R. Deque *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 7 p refs In FRENCH (See N70-29401 15-02)
Avail: CFSTI

Aeroelasticity is considered in relation to the problems of control and the influence of stabilizers on the vibration modes of an aircraft. Studies were conducted to improve the natural flight qualities of the aircraft and the damping characteristics of the structural modes. Protection against system failure is discussed, along with techniques for artificial damping. It is concluded that aeroelastic effects play a very large role in studying the flight characteristics and control system of a supersonic transport. Transl. by M.G.J.

N70-29422# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
THE INFLUENCE OF THE ELASTIC DEGRESS OF FREEDOM UPON A CONTROL SYSTEM WITH A SMALL STABILITY MARGIN
R. Staufenbiel, H. Wald, and A. Kanarachos *In* AGARD Aeroelastic

Effects from a Flight Mech. Standpoint Mar. 1970 ref 21 p (See N70-29401 15-02)
Avail: CFSTI

Flight testing of an automatic flight control system, intended to guide a missile at low altitudes over the open sea, revealed unexpected stability problems. These problems can be explained by the fact that the suspension of the rate gyro introduced an additional coupling moment between vertical acceleration and angular velocity which resulted in a reduction of the stability margin. Author

N70-29425# Office National d'Etudes et de Recherches Aerospatiales, Paris (France.)
FLIGHT TESTS WITH A GUST ALLEVIATION DEVICE: DESIGN ANALYSIS [ESSAIS EN VOL D'UN DISPOSITIF ABSORBEUR DE RAFALES CONFIGURATION DU SYSTEME - ANALYSE]
Jacqueline Boujot *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1967 10 p refs In FRENCH; ENGLISH summary (See N70-29401 15-02)
Avail: CFSTI

Minimizing the response of an aircraft to atmospheric turbulence is attempted through automatic commands of the usual control surfaces without modifying the aircraft flight characteristics. For this purpose, flight control inputs are defined by a convolution of the vertical component of turbulence with a workable optimum function. Applied to a delta wing aircraft, the general theory suggests a very simple gust alleviation device. The data obtained indicate that the responses to turbulence are much improved by this device. Author

N70-29513*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF THE EFFECTS OF SEA STATE ON DOPPLER-RADAR MEASUREMENT OF AIRCRAFT GROUND SPEED
Donald R. Buchele [1970] 17 p refs
(NASA-TM-X-52792; E-5654) Avail: CFSTI CSCL 17G

An analysis is made of the effect of sea state on Doppler-radar measurement of aircraft ground speed. Previously published data taken at both microwave and visible-light wavelength are used to estimate the ground-speed error in a representative situation. The magnitude of the error is determined by the sea state and by the flight direction relative to the ground-wind direction. The results indicate that a probable error of less than one percent is generally achievable after correction for the effect of sea state. Author

N70-29623# Systems Technology, Inc., Princeton, N.J.
JET TRANSPORT INSTRUMENT APPROACH APPLICATION OF A THEORY FOR MANUAL CONTROL DISPLAY SYSTEMS
W. F. Clement, H. R. Jex, and D. Graham *In* AGARD Probl. of the Cockpit Environment Mar. 1970 25 p refs (See N70-29618 15-02)
Avail: CFSTI

An illustrative application of a theory for manual control displays to the instrument landing approach of a large subsonic jet transport is presented. A methodical procedure is disclosed for formulation of compensatory display/control systems. Manual approach height and lateral position control are treated in multiloop dynamic analyses so as to select preferred variables for measurement and display. Closed-loop system performance and pilot scanning and workload measures are also evaluated. The example concludes with the prediction of a preferred display arrangement. Comparison with an FAA Category 2 instrument panel arrangement selected by an airline operating the example aircraft, shows the predictions to be remarkably accurate. Author

N70-29628 Deutsche Versuchsanstalt fur Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
TEST RESULTS WITH NEW ANALOG DISPLAYS FOR ALL-WEATHER LANDINGS
V. Wilckens and W. Schattenmann
Avail: CFSTI

Two situation analog displays were evaluated on a fixed base simulator programmed for a small propeller aircraft and a subsonic jet fighter. One display was derived from the type of information which is used by a car driver or a pilot during the flare and ground roll phase. The model for the other display was the formation flight information in a special form. In addition, tests were made with some versions of the ILS-instrumentation. The results exhibited small errors in approach path tracking and flare control for both displays. However, they allowed easy control and high success rates after a short training period. Both displays inherently provide a sort of command indication, which if followed cause an asymptotic interpretation of the ideal path, the pilot's decision is final. Author

N70-29638# Royal Aircraft Establishment, Bedford (England).
THE HEAD-UP DISPLAY OF APPROACH INFORMATION
J. Johnson and R. W. Jones *In* AGARD Probl. of the Cockpit Environment Mar. 1970 5 p (See N70-29618 15-02)
Avail: CFSTI

A head-up display was designed to display to the pilot all the essential information for the approach using the minimum number of symbols. The display contains a symbol which identifies the touchdown point. There is no relative motion between this symbol and the real world because the display is fully stabilized in the ground axes. The display also contains a flight director facility, aircraft position information, and roll and pitch attitude information. All the data inputs required for this system can be derived with sufficient accuracy from equipments already in general use. Author

N70-29640# Royal Aircraft Establishment, Farnborough (England).
THE APPLICATION OF CORRELATION TECHNIQUES TO GROUND-BASED AIDS IN THE TERMINAL AREA
J. Benjamin *In* AGARD Probl. of the Cockpit Environment Mar. 1970 14 p ref (See N70-29618 15-02)
Avail: CFSTI

The cockpit environment is affected by the performance of the ground-based radio aids. All information derived from the ground should be appropriate to the operations and of absolute reliability and integrity. An important component is the Instrument Landing System (ILS) which is now being used for guidance in automatic landing. The merits and deficiencies of ILS are analysed, and a recommendation to use correlation detection techniques mated to three-dimensional hyperbolic phase fields is proposed. Its application to other terminal area problems is covered. Author

N70-29644# Human Factors Research, Inc., Goleta, Calif.
THE DISPLAY OF AERONAUTICAL CHARTS
James J. Mc Grath *In* AGARD Probl. of the Cockpit Environment Mar. 1970 7 p refs (See N70-29618 15-02)
Avail: CFSTI

Three main classes of displays are described: direct-view, projection, and kinescopic displays; and the main advantages and disadvantages of each are compared. Direct-view displays are best suited to users who require a lightweight display with mission-specific annotations on the charts. Projection displays are best suited to users who require great flexibility in choice of routes and destinations, and who have little time for pre-flight planning. Kinescopic displays are best suited to users who require a versatile display surface and superpositioned navigation information. The requirements are outlined for further research and development to improve methods of chart logistics and preparation, to improve color microphotography, and to improve the design of charts for display application. Author

N70-29680*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
CONTROL SYSTEM OPTIMIZATION FOR SATURN 5 LAUNCH VEHICLES USING GRADIENT TECHNIQUES Final Report
C. L. Connor and W. Trautwein Feb. 1970 44 p refs
(Contract NAS8-30515)
(NASA-CR-102712; LMSC/HREC-D162122-i; HREC-0515-1)
Avail: CFSTI CSCL 17G

A computerized method for the engineering design of attitude control systems is studied. The variation problem of finding optimal time-varying controller parameters (gains) is reduced to a sequence of parameter searches which result in near-optimal piecewise linear gain schedules and are rapidly determined by an efficient hybrid computing scheme. Hybrid computation is applied to enable both realistic simulation of vehicle dynamics on the analog console and iterative adjustments of critical controller parameters based on optimum-seeking modern gradient techniques in the digital unit. The approach thus combines the practical features of analog simulation with the systematic parameter search methods of multi-dimensional gradient techniques. A practical feature of the method is the possibility to specify design goals in the most direct manner with virtually no mathematical constraints concerning its functional form. As an application example, the Saturn V attitude control problem was chosen. The specific design goal was to find controller adjustments which would minimize peak bending loads due to representative wind forces and due to an engine failure at a critical flight time. Author

N70-29812*# Scripta Technica, Inc., Washington, D.C.
STABILIZATION OF COMMUNICATION SATELLITES WITH FLYWHEELS [STABILISIERUNG VON NACHRICHTENSATELLITEN MIT SCHWUNGRAEDERN]
U. Renner Washington NASA Jun. 1970 9 p refs Transl. into ENGLISH from Raumfahrtforschung (West Germany), no. 2, 1970 p 75–78
(Contract NASw-2036)
(NASA-TT-F-13116) Avail: CFSTI CSCL 17G

Various types of flywheel stabilization for communication satellites and of the requirements which the flywheels used would have to satisfy are discussed. General aspects of position stabilization of communication satellites are briefly examined and the advantages of satellite stabilization by flywheels are pointed out. Stabilization by three reaction wheels and by control moment gyro are considered. Another method described requires an occasional corrective action by a gas jet. Experience obtained in the development of flywheels for such space applications is discussed. Author

N70-29851# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE GYROSCOPIC EFFECT: ITS MANIFESTATIONS AND USES [GIDROSKOPICHESKII EFFEKT EGO PROYAVLENIYA I ISPOLZOVANIE]
V. A. Pavlov 14 Jan. 1970 178 p refs Transl. into ENGLISH from the Russian
(AD-701967; FTD-HT-23-228-69) Avail: CFSTI CSCL 17/7

The book is intended to familiarize the reader with the essentials of the gyroscopic effect observed in the spinning top; it discusses the manifestations of this effect in the natural world around us and in machines and weapons that we use, and deals with its uses in various branches of engineering. Author (TAB)

N70-30303# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPACE NAVIGATION
Am. Aleksandrov et al 1 Dec. 1969 8 p Transl. into ENGLISH from Pravda (Moscow), 3 Nov. 1969 p 2
(AD-702284; FTD-HT-23-590-69) Avail: CFSTI

Whatever may be the purpose of a given space-vehicle launching, importance invariably attaches to the ability to monitor the status and viability of the vehicle itself and of its individual on-board systems, to verify the proper execution of the flight program, to formulate and refine specific mission assignments, and to transmit to Earth the results of observations and investigations. Briefly stated, what is needed is a ground command-telemetry complex. The optimal distribution of functions between on-board systems and ground-based facilities, the further rational expansion of the complex, along with its automation and improvement - these are very vital tasks, inseparable from the fundamental problems involved in the exploration and exploitation of outer space. Author (TAB)

N70-30399*# Bellcomm, Inc., Washington, D.C. Technical Library.
ON THE OPTIMUM STABILIZATION OF SOLID BODY'S ROTARY MOTION WITH THE AID OF A GUIDED GYROSCOPE [OB OPTIMAL'NOY STABILIZATSII VRASHCHATEL'NOGO DVIZHENIYA TVERDOGO TELA PRI POMSHC]
V. V. Krementulo et al 5 Jun. 1970 11 p refs Transl. into ENGLISH from Mekh. Tverd. Tela. (Moscow), no. 5, 1969
Sponsored by NASA
(NASA-CR-110428; A70-16221) Avail: CFSTI CSCL 17G

The solution of the problem of optimum stabilization of the equilibrium position of a free solid body with the help of a guided gyroscope installed on the body, is shown. It is also shown that, with the aid of the very same means, one may achieve the optimum, in the sense of minimum of a certain functional, stabilization of the stationary motion of a solid body, constituting a permanent rotation around the axis of dynamic symmetry. Author

N70-30611# Elliott Bros., Ltd., London (England). Space and Guided Weapons Div.
A STAR POINTING ATTITUDE CONTROL SYSTEM FOR SOUNDING ROCKETS
I. F. M. Walker [1970] 20 p Presented at the Brit. Interplanet. Symp. on Sounding Rockets, Cardiff, U.K., Apr. 1970 Prepared jointly with RAE
Avail: CFSTI

A three-axis star pointing attitude control system has been developed for the Skylark rocket vehicle, and the first launch is expected in July, 1970 from Woomera. The datum on the roll axis is aligned to within one degree of the desired direction using magnetometers. A strapdown rate gyro system is used to desired direction using magnetometers. A strapdown rate gyro system is used to carry out precision inertial maneuvers from a moon reference in order to lock the star sensor on to the target star. The system is capable of locking on to stars down to visual magnitude +5, with a typical pointing noise of 1.5 arc seconds rms. down to visual magnitude +5, with a typical pointing noise of 1.5 arc seconds rms. Author (ESRO)

N70-30538# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
GEOGRAPHIC COORDINATE RECKONING SYSTEM WITH AUTOMATIC ADJUSTMENT FOR NAVIGATIONAL CORRECTIONS
P. S. Davydov et al 30 Jan. 1970 7 p refs Transl. into ENGLISH from Rybn. Khozy. (Moscow), v. 44, no. 5, 1968 p 84–87
(AD-703001; FTD-HT-23-336-69) Avail: CFSTI CSCL 17/7

Automatic reckoning is at present virtually the only autonomous method of navigation. Its principle consists in the systematic computation of the geographical coordinates of the ship on the basis of information about elements of its motion-track angle and speed. The accuracy of reckoning primarily depends on the accuracy of navigation instruments after taking into account various navigation corrections such as the correction factor for speed, the speed deviation of the gyrocompass, the angle of wind drift and the angle of current drift. Formulas for these corrections are presented and it is shown that their calculation can be automated. Hence also it is possible to automatically obtain data on the track angle and true speed by solving the pertinent equations with the aid of a special-purpose computer. TAB

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N70-29225# Panametrics, Inc., Waltham, Mass.
ULTRASONIC THERMOMETRY IN LMFBR SYSTEMS Progress Report, Period Ending Sep. 1969
L. C. Lynnworth, E. H. Carnevale, E. P. Papadakis, and S. S. Fam Oct. 1969 31 p refs
(Contract AT(30-1)-3906)
(NYO-3906-8) Avail: CFSTI

Progress in the development of an ultrasonic system to measure temperature in the coolant, cladding, and fuel of liquid metal-cooled fast breeder reactors is described. An anodized aluminum coil was tested at 1000 F for 1000 hours with no signal degradation. Attenuation in a 0.023 dia. by 6 inch length of remendur wire was found to be negligibly small at 1000 F. A composite thermocouple/ultrasonic temperature probe, fabricated by GE, was tested. Rhenium was calibrated to 4000 F. NSA

N70-29239# Oak Ridge National Lab., Tenn.
RADIOISOTOPE PROGRAM (8000) Progress Report, Jan. 1970
A. F. Rupp Feb. 1970 24 p
(Contract W-7405-eng-26)
(ORNL-TM-2876) Avail: CFSTI

Developments are reported for: neutron products; cyclotron products; fission products; radiation source development; radioisotope source safety testing; radioisotope applications development; radiation processing applications development; radioisotope sales; and radioisotope production. NSA

N70-29271# General Electric Co., Sunnyvale, Calif. Breeder Reactor Development Operation.
SODIUM TECHNOLOGY DEVELOPMENT PROGRAM. MASS TRANSFER INVESTIGATIONS IN LIQUID METAL SYSTEMS Quarterly Progress Report, Sep. – Nov. 1969
Dec. 1969 22 p refs
(Contract AT(04-3)-189)
(GEAP-13539-11; QPR-11) Avail: CFSTI

Activities in programs devoted to corrosion testing of reactor materials by sodium are summarized. During the report period candidate materials for use as cladding on oxide fuels were studied. Information is included on behavior of Types 304, 316, and 347 stainless steels in loop sodium at 1300 F. Similar information is included on Incoloy 800. Temperature profiles, loop geometry, and sodium purity controls in effect during the tests represent environments of large fast reactors. NSA

N70-29274# Los Alamos Scientific Lab., N. Mex.
PYROLYTIC CARBON COATINGS FOR Pu(238)O2 MICROSPHERES: DEVELOPMENT OF COATING AND TESTING PROCEDURES
W. J. McCreary and W. Pritchard Aug. 1969 13 p refs
(Contract W-7405-eng-36)
(LA-4298) Avail: CFSTI

A laboratory-scale procedure was developed for applying pyrolytic carbon coating to Pu(238)O2 microspheres, a possible energy source for small nuclear reactors for use in space to contain the radioactive material during reentry. Preliminary work was done with depleted UO2 and Pu(239)O2 microspheres. Pyrolytic carbon coatings were deposited onto the microspheres in fluidized beds at 1200 and 1300 C from methane-helium and acetylene-helium mixtures in a 1-in.-diam graphite coater. The 40-microns-thick pyrolytic carbon deposited at 1200 C from acetylene-helium was laminar and optically active, typical of dense, oriented pyrolytic carbon. These particles survived without apparent damage for 10 min at 1550 C, but 38% of the particles failed after 10 min at 1750 C and all particles were damaged or failed completely after 10 min at 2000 C. The principal mode of failure was shell bursting. The 70-microns-thick coating deposited at 1300 C from methane-helium was optically isotropic and porous. These particles survived without apparent damage for 10 min at 1750 C. After 10 min at 2000 C, most of the particles showed metal migration into the coating, but there were no failures due to shell bursting. Author (NSA)

N70-29277# Babcock and Wilcox Co., Lynchburg, Va. Research and Development Div.
PHYSICS VERIFICATION PROGRAM, PART 3 Quarterly Technical Report, Jul. – Sep. 1969
W. G. Pettus, M. N. Baldwin, G. T. Fairburn, M. E. Stern, and R. C. Mason Dec. 1969 50 p refs
(Contract AT(30-1)-3647)
(BAW-3647-15) Avail: CFSTI

Experiments to measure the steady state power distribution through critical assembly mockups of typical PWR designs are described. The critical assembly used in the experiments consisted of aluminum clad UO2 fuel rods. Small lattice experiments and zoned or mixed lattice experiments with UO2 and PuO2-UO2 fuel are described. The measurements of k sub infinity for poisoned uniform lattices of various metal-to-water ratios are presented. NSA

N70-29296# Hittman Associates, Inc., Columbia, Md.
SPHERICAL CAPSULE TECHNOLOGY PROGRAM Quarterly Progress Report, 1 Apr. – 30 Jun. 1968
Apr. 1969 54 p refs Revised
(Contract AT(29-2)-2475)
(HIT-345-Rev-A) Avail: CFSTI

Progress on the development of spherical radioisotope heat source fuel capsules is reported. Heat sources were sized for both finned and stagnation designs using both bare foam insulation and ceramic foam-metal composites in a thermal switch mode of operation; a non-vented heat source was evaluated for its ability to contain helium during reentry; the effect of outer graphite shells on the reentry performance was evaluated; terminal trajectories were computed for a spherical heat source with and without spin-up fins; thermal switch testing was performed on silica foam-silver composites; mechanical and thermal (using an electrical analog) properties of ceramic foam-silver composites were measured; weldability studies were performed on ten promising superalloy material capsule candidates; ten superalloy materials were evaluated for oxidation characteristics at 2300 F; data were generated on the tensile properties of ten superalloys in the unaged and aged conditions; and hastelloy-N shells were fabricated for test in the impact facility. Author (NSA)

N70-29348# Oak Ridge National Lab., Tenn.
PRELIMINARY EVALUATION OF THE FIRST FUEL ROD FAILURE TRANSIENT TEST OF A ZIRCALOY-CLAD FUEL ROD CLUSTER IN TREAT
R. A. Lorenz, G. W. Parker, and D. O. Hobson 26 Nov. 1969

47 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2774) Avail: CFSTI

The test was conducted as planned: all rods ruptured and fission products from the preirradiated center rod were collected on the two fission product collection systems. Fission heating in the UO2 pellets raised the Zircaloy cladding temperature of 7-rod bundle 72 F/sec for about 20 sec. A variety of fuel rod construction including two clad alloys, different plenum volumes, different pellet to cladding clearances, and internal pressures ranging from 115 to 215 psia (77F) were in the hot cell. Photographs were taken of the bundle and of the individual rods after removal from their supports. Estimations of cooling channel blockage made from the photographs showed a maximum of approximately 58% blockage. The TREAT fuel rod failute tests utilize UO2 pellets as the uniquely realistic heat source to duplicate precisely the internal heat transfer characteristics of actual power reactor fuel rods. Author (NSA)

N70-29354# Gulf General Atomic, San Diego, Calif.
SNAP-15A THERMOELECTRIC GENERATOR Summary Report, 1 Jul. 1968 – 30 Jun. 1969
22 Jan. 1970 45 p ref
(Contract AT(04-3)-167)
(GA-9763) Avail: CFSTI

The activities of the SNAP %15A testing program for the period July 1968 through June 1969 are summarized. During this period twenty-five generators were continued on life testing and the performance data were analyzed. One of the generators with more than 5 years lifetime was removed from test and examined for compatibility evaluation. Examination of the interior components of the generator showed they were in excellent condition after operation in air for over 4 years. The changes in performance of all the generators due to causes other than fuel depletion have been less than 1% per 10,000 hours. A life testing program for the remaining twenty-four generators is being continued. Several electrically heated generators will have exceeded 5 year lifetime at the end of FY 70. Author (NSA)

N70-29355# Idaho Nuclear Corp., Idaho Falls.
REACTOR ENGINEERING BRANCH Annual Report for Fiscal Year 1969
E. D. Covington, ed. Nov. 1969 106 p refs
(Contract AT(10-1)-1230)
(IN-1335) Avail: CFSTI

Research and development is summarized in four sections and includes the following: (1) An investigation was conducted to determine the influence of hydrogen on the ductile and static load properties of several irradiated intermediate strength low alloy steels. The degree to which these properties were effected was generally found to be dependent on strength level. Increasing the strength level as a result of heat treatment, cold work, or irradiation increased the extent to which those parameters were reduced per given hydrogen content. (2) Results of destructive examination of five ETR boron-foil fuel elements indicate that this type of fuel element can safely be used in low and medium power positions of the ETR. (3) Limiting heat transfer capability in natural convection and in emergency and operational flow regimes was determined in the ATR startup program by means of specially designed and intrumented experimental fuel elements. (4) A coupled fast reactivity measurement facility was installed in ARMF-2 for measurement of fast neutron integral cross sections. Fission rate studies in ATRC have shown good correlation between experiment fluxes and lobe power. D.L.G.

N70-29356# Battelle-Northwest, Richland, Wash. Chemical Technology Dept.
HANFORD Pm 146 BURNOUT EXPERIMENTS
J. C. Sheppard and H. H. Van Tuyl Jan. 1970 22 p refs
(Contract AT(45-1)-1830)
(BNWL-1270) Avail: CFSTI

Hanford Pm-147 containing about 0.3 ppM Pm-146, was irradiated in a Hanford K-Reactor in an attempt to burn out the Pm-146 present and thereby reduce the gamma dose rate to a level where Pm-147 could be used in circulatory assist devices. The Pm-146 content was reduced by a factor of two for the longest irradiation, which was less than the expected result. A cross section of 3500 b was found for Pm-146 compared to 8400 b found by Pinajian, which partially explains the low Pm-146 burnout. The Pm-146 cross section varied slightly with position in the target, suggesting resonance capture of epithermal neutrons. Explanations for the low burnout of Pm-146 are examined and possible ways of further reducing the Pm-146 content are suggested. Author (NSA)

N70-29357# Gulf General Atomic, San Diego, Calif.
HTGR BASE PROGRAM Quarterly Progress Report, Period Ending 30 Nov. 1969
30 Dec. 1969 42 p refs
(Contract AT(04-3)-167)
(GA-9815) Avail: CFSTI

Progress was reported on fission product mechanism, recycle fuel studies, fuel management, advanced coated particle management, and graphite research. The fission product mechanism of strontium in graphite was examined for diffusion, under high pressure, and for vaporization. Recycling refabrication, and head-end reprocessing of spent HTGR fuel elements was studied. A series of capsule irradiations was evaluated for advanced types of coated particles under potential HTGR irradiation environments. S.S.

N70-29364# Oak Ridge National Lab., Tenn.
ISOTOPES KILOWATT PROGRAM. TASK 1: CONCEPTUAL DESIGN AND EVALUATION
R. A. Robinson Jan. 1970 333 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2366) Avail: CFSTI

Conceptual designs were prepared for several types of radioisotope electric power systems in order to determine which types of systems show the most promise for early development for terrestrial and undersea applications in the 2 kW(e) to 10 kW(e) power range.. Strontium-90 titanate and Co-60 are considered as potential radioisotope fuels for the systems. The present development status of various energy conversion system components is reviewed. Author (NSA)

N70-29365# Oak Ridge National Lab., Tenn.
DESIGN AND CONSTRUCTION OF CORE IRRADIATION-SPECIMEN ARRAY FOR MSRE RUNS 19 AND 20
C. H. Gabbard 22 Dec. 1969 23 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2743) Avail: CFSTI

A new MSRE core specimen array was designed and fabricated to replace the type of metallurgical surveillance specimen array that was used in the MSRE through Run 18. The main purpose of the new array is to measure the capture-to-absorption ratio of U-233 and to determine the effects of salt velocity, turbulence, and surface finish on the deposition of fission products on graphite and on Hastelloy-N. Two additional test specimens were included, one of pyrolytic graphite to determine if there is permeation of fuel salt or its constituents into the graphite and one of Hastelloy-N to expose a series of electron microscope screens in a trapped gas pocket. The new specimen array was installed on July 31, 1969 and was exposed in the reactor core for 12,943 MWhrs of reactor operation during Runs 19 and 20. Author (NSA)

N70-29374# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.
STAINLESS STEEL CLADDING DEVELOPMENT Quarterly

Progress Report, Period Ending 30 Sep. 1969
30 Sep. 1969 31 p refs
(Contract AT(30-1)-4135)
(WARD-4135-2) Avail: CFSTI

Activities in programs to improve commercially available Type 316 austenitic stainless steels for use as cladding for LMFBR fuel pins are reported. Work on stress rupture, and unaxial and biaxial creep testing of air melted stainless steel continued. Additional low cycle high strain fatigue tests were delayed pending proof testing a new specimen design. Twelve lots of vacuum melted Type 316 stainless stell tubing representing three melting practices, two grain sizes, and two conditions, e.g., 20% cold worked and solution annealed, were received and accepted. Micro-characterization and mechanical property testing were initiated on these materials. An order was placed for vacuum melted planetary swaged tubing to be used in the characterization studies. Ten lots of double vacuum remelted Type 316 stainless steel tubing for the Oxide Fuel Element Development Program (19 pin encapsulated assembly) were received and accepted. Double vacuum melted tubing for the 37 pin assembly was ordered. The weldability subtask continued. The first series of weldability studies has been completed on annealed Type 316 stainless steel tubing. The second series of weldability studies will be conducted on 15 to 20% cold worked tubing. Author (NSA)

N70-29392# Oak Ridge National Lab., Tenn.
MOLTEN-SALT REACTOR PROGRAM Semiannual Progress Report, Period Ending 31 Aug. 1969
Feb. 1960 252 p
(Contract W-7405-eng-26)
(ORNL-4449) Avail: CFSTI

Research and development progress is reported on radiochemistry of nuclear reactors, molten salt processing and preparation, reactor materials, and molten salt breeder reactor design. NSA

N70-29399# General Electric Co., San Jose, Calif. Atomic Power Equipment Dept.
REACTOR PRIMARY COOLANT SYSTEM RUPTURE STUDY Quarterly Progress Report, Jul. – Sep. 1969
Oct. 1969 78 p
(Contract AT(04-3)-189)
(GEAP-10120; QPR-18) Avail: CFSTI

Fatigue specimens were tested in air to determine the variability of cyclic life. This was found to be 1-1/2 times that assumed before testing. Now the smallest effect of environment which can be considered significant will be a factor of between 1.5 and 2 on cycles, compared with factors between 1.1 and 1.5 previously determined. As part of the PAPA development effort, a review and evaluation of related computer codes and of the PAPA code are in progress. Machining of flaws in a series of ell pipe specimens was completed. An unflawed tee specimen was hydraulically burst, fracturing 8880 psi. In prototype pipe fatigue, one stainless tee and two carbon steel elbows were tested. In cyclic strain aging, the results of Charpy impact tests of A-212B plate following monotonic tensile deformation at 350 F indicate an appreciably lower shift in the 50% FATT for a given total strain than similar specimens cyclically strain aged at 350 F. Also, comparison of the notch strength of a virgin notched bend bar indicates notch strength properties similar to a specimen cyclically strain aged to induce a brittle region near the notch. The Dresden-I test loop piping installation was completed. Preparations were made for shakedown testing of the fatigue test machine containing dynamic test specimens of the final design. The dynamic and static test specimen plan was reviewed and minor revisions were made. Author

N70-29431# Argonne National Lab., Ill.
MECHANICAL IMPROVEMENTS OF THE EBR-2 FUEL UNLOADING MACHINE
James B. Waldo Nov. 1969 52 p refs
(Contract W-31-109-eng-38)
(ANL-7585) Avail: CFSTI

The EBR-II fuel unloading machine (FUM) transfers all reactor subassemblies between the Na-filled primary tank and the interbuilding coffin. The machine is basically a self-propelled shield cask, which moves on rails between the primary-tank transfer port and the interbuilding-coffin pit. The FUM control panel and most of the mechanical equipment are located at the top of the shield cask. A subassembly gripper mechanism in the machine can be extended downward, through the shielding, into the primary-tank transfer port or into the interbuilding coffin to insert or remove a reactor subassembly is being handled by the FUM. The mechanical changes and improvements, made to the FUM since the original design, are described. These changes have evolved from continuous surveillance and engineering evaluation of the problems that have occurred with the machine during normal fuel handling. Author (NSA)

N70-29446# Argonne National Lab., Ill.
REACTOR DEVELOPMENT PROGRAM PROGRESS REPORT, DECEMBER 1969
A. Glassner and A. D. Rossin, comps. 29 Jan. 1970 139 p refs
(Contract W-31-109-eng-38)
(ANL-7655) Avail: CFSTI

Highlights of project activities for December 1969 are summarized. LMFBR physics development, component development, and sodium technology are reviewed. Operations and analysis of the ZPR-3, ZPR-6, ZPR-9, and ZPPR are described. The EBR-2 research and development projects, fuel fabrication, and operations are summarized. Reactor fuels and materials development, physics studies, reactor engineering, reactor chemistry, LMFBR safety, and thermal effluent studies are reported. NSA

N70-29455# General Electric Co., Schenectady, N.Y. Knolls Atomic Power Lab.
ASYMPTOTIC FORMULAS FOR APPROXIMATE NUMERICAL SOLUTION OF THE REACTOR KINETICS EQUATIONS
D. B. Mac Millan 11 Feb. 1970 20 p ref Presented at Reactor Transient Analysis Symp. on Dyn. of Nucl. Systems, Tucson, Ariz., 23-25 Mar. 1970 Submitted for publication
(Contract W-31-109-eng-52)
(KAPL-P-3875; Conf-700304-1) Avail: CFSTI

Given a system of differential equations in which some variables have very short response times, a related system of equations may be derived which may be solved numerically using reasonably-sized time steps to obtain a solution which is an asymptotic approximation to the solution of the original equation. The application of this technique to the equations of space-dependent reactor kinetics is described. The technique yields a sequence of asymptotic approximations of successively higher order; the first of these is the prompt jump approximation. Numerical results are presented for some space-independent reactor kinetics problems to indicate the kind of accuracy that may be expected from these approximations. Author (NSA)

N70 29456# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
U-238 RESONANCE CAPTURE INTEGRALS FOR RODS OF UO2, UC, AND U-METAL
D. J. Pellarin and N. P. Baumann Jan. 1970 26 p refs
(Contract AT(07-2)-1)
(DP-1203) Avail: CFSTI

Rod diameters were 0.355, 0.500, 0.750, and 0.940 inch. Simultaneously activated thin foils of U-238 metal were the reference standards. The integrals included corrections for foil perturbation effects, counter efficiencies, and neutron spectra, which were determined from detailed measurements and computations. Analytical fits to the measured integrals excluding the 1/v component are given. The integrals for the different chemical forms could not be correlated by any simple application of the equivalence theorem. Author (NSA)

N70-29457# General Electric Co., Sunnyvale, Calif. Breeder Reactor Development Operation.
SEFOR FUEL HANDLING
M. L. Johnson, R. A. Becker, and J. M. Haar Dec. 1969 32 p refs
(Contract AT(04-3)-540)
(GEAP-13565) Avail: CFSTI

Frequent fuel loading, removal, cleaning, examination and storage operations are necessary to support the planned program in the Southwest Experimental Fast Oxide Reactor (SEFOR). A refueling cell above the reactor vessel contains special equipment designed to perform these operations. Equipment is controlled at consoles outside the cell by an operator who can observe all operations by means of windows, mirrors, and closed-circuit television. Each item of equipment has performed its intended function dependably. Only a few malfunctions and failures have forced brief work stoppage or use of alternate equipment. Author (NSA)

N70-29458# Idaho Nuclear Corp., Idaho Falls.
SECHT 3: AN EXPERIMENTAL INVESTIGATION OF TOP AND BOTTOM FLOODING OF A NUCLEAR BUNDLE SIMULATOR
C. M. Moser and R. W. Griebe Feb. 1970 112 p refs
(Contract AT(10-1)-1230)
(IN-1355) Avail: CFSTI

The SECHT Project consisted of four series of tests of which the third series is described. The primary objective of the SECHT tests was to perform timely sensitivity studies by using readily available hardware. Exact scaling of a segment of a reactor core was not accomplished; therefore, the results presented are more qualitative than quantitative. The SECHT testing program consisted of 55 experiments that were designed to form a parametric study over the range of variables thought possible at the initiation of the emergency core coolant injection in contemporary water cooled reactors. Specific results show that the arrest and turn-around of the bundle temperature excursion occurs more quickly in tests which have high initial temperatures and that the sensitivity of turnaround time to bundle power decreases with increasing bundle initial temperature. The effect of the constriction is shown to be strongly dependent on flow rate. Author (NSA)

N70-29459# Argonne National Lab., Ill.
REACTOR DEVELOPMENT PROGRAM Progress Report, Period Ending Jan. 1970
25 Feb. 1970 137 p refs
(Contract W-31-109-eng-38)
(ANL-7661) Avail: CFSTI

Highlights of project activities for January 1970 are summarized. LMFBR physics development, component development, sodium technology, and 1000 MW(e) plant development are reviewed. Operations and analysis of the ZPR-3, ZPR-9, and ZPPR are described. The EBR-2 research and development projects, fuel fabrication, and operations are summarized. Reactor fuels and materials development, physics studies, engineering development, fuel cycle chemistry, and LMFBR safety studies are reported. NSA

N70-29467# Iowa State Univ. of Science and Technology, Ames.
REACTOR MATERIALS DEVELOPMENT Quarterly Report, Oct. – Dec. 1969
A. F. Voigt, ed. Dec. 1969 22 p refs Supported by AEC
(IS-RD-20) Avail: CFSTI

Progress is reported on purification of Th by electrotransport, preparation of V metal, purification of V by electrotransport, preparation of U metal by C reduction of U3O8, extraction of Cs, and preparation of Mo metal. Results of research on phase diagrams of rare earths and refractory metals are included. Ceramics research on diffusion of Y2O3 and rare earth oxides is reported along with fabrication of Y2O3 and Er2O3 shapes and preparation of dense UO2 shapes. NSA

N70-29468# Stanford Univ., Calif. Nuclear Engineering Lab.
ACTIVATION MEASUREMENTS OF THE DOPPLER EFFECT IN U-238 AND TH-232 AS A FUNCTION OF SURFACE AREA-TO-MASS RATIO Final Report
Robert N. Whitesel Dec. 1969 216 p refs
(Contract AT(04-3)-326)
(SU-326-P-9-3) Avail: CFSTI

The Doppler effect for U-238 and Th-232 was measured in the Stanford Pool Reactor in thermal spectra. Measurements were made at six values of surface-to-mass (S/M) ratios ranging from 1.24 to 23.66 sq cm/gm for uranium foils and at S/M ratios of 6.81 and 19.67 for thorium foils. The experimental facilities and procedures are described, and the results are tabulated. NSA

N70-29501# General Electric Co., San Jose, Calif. Atomic Power Equipment Dept.
DEPRESSURIZATION PERFORMANCE OF THE GENERAL ELECTRIC BOILING WATER REACTOR HIGH PRESSURE COOLANT INJECTION SYSTEM
A. E. Rogers and J. E. Torbeck May 1969 27 p refs Sponsored by AEC
(APED-5447) Avail: CFSTI

The functioning and performance of a high pressure coolant injection (HPCI) system in boiling water power reactors are discussed. The experimental determination of HPCI mixing efficiency is described; detailed data are shown graphically. Results of the analytical evaluation of the HPCI system are discussed. Depressurization test apparatus, results, and procedures are described; data are presented in graphic form. NSA

N70-29520# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.
VANADIUM ALLOY CLADDING DEVELOPMENT Quarterly Progress Report, Period Ending 30 Sep. 1969
Nov. 1969 16 p refs
(Contract AT(30-1)-3791)
(WARD-3791-42) Avail: CFSTI

Activities in programs to develop and evaluate V-base alloys for LMFBR fuel cladding are summarized. Results of research on V reactivity with interstitial elements are presented along with results of corrosion testing of Vanstar alloys by flowing sodium and results of alloy-fuel compatibility testing. NSA

N70-29531# Bettis Atomic Power Lab., Pittsburgh, Pa.
A MEASUREMENT OF NEUTRON SPATIAL DISTRIBUTION IN A WATER MODERATED, THORIUM OXIDE ROD LATTICE (LWBR DEVELOPMENT PROGRAM)
P. B. Beilin Feb. 1970 40 p refs
(Contract AT(11-1)-Gen-14)
(WAPD-TM-915) Avail: CFSTI

A large lattice of Zircaloy-4 rods filled with ThO2 pellets and completely submersed in water was used to test the cross sections of ThO2, H2 and Zr. The spontaneous fissions from 5 micrograms of Cf-252 provided the source neutrons. Cd covered In foils within the rods detected the neutrons up to 35 centimeters from the source. The measured foil activations were subsequently modified to correspond to activations by the main 1.458-ev indium resonance alone. This measured distribution was then compared to the predictions of a 3-D Monte Carlo calculation. As the distance from the source increased, the measured distribution decreased significantly slower than the Monte Carlo predicted distribution. Author (NSA)

N70-29532# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

COBRA-2: A DIGITAL COMPUTER PROGRAM FOR THERMAL-HYDRAULIC SUBCHANNEL ANALYSIS OF ROD BUNDLE NUCLEAR FUEL ELEMENTS

D. S. Rowe Feb. 1970 60 p refs
(Contract AT(45-1)-1830)
(BNWL-1229) Avail: CFSTI

The COBRA-2 program calculates the steady-state flow and enthalpy in the subchannels of rod bundle nuclear fuel elements during both boiling and nonboiling conditions. The program uses a mathematical model that includes the effects of turbulent and diversion crossflow mixing between the subchannels. The equations of the mathematical model are solved as an initial-value problem by using finite differences. COBRA-2 includes the effect of subcooled voids. Subchannels may be typed so that nonuniform hydraulic behavior can be considered. Distorted bundles may be analyzed by selecting variable subchannel areas and gap spacings along the length. Spacer pressure loss and forced diversion crossflow can be considered. Turbulent mixing without boiling may be specified by several different correlation forms. During boiling, the mixing correlation for nonboiling can be used or turbulent mixing may be given as a function of steam quality. Adjustable dimensions are included in COBRA-2 to allow the user to expand or contract the size of the program to accomodate his computer storage capability. The program has performed successfully with 36 subchannels, 25 fuel rods and 60 subchannel connections. Author (NSA)

N70-29534# Sandia Corp., Albuquerque, N.Mex.

HELIUM RELEASE DATA FOR PU(238)O2 MICROSPHERES

W. A. Stark, Jr. Nov. 1969 172 p refs Sponsored by AEC
Supersedes SC-DC-69-1892
(SC-DC-69-1892-B; SC-DC-69-1892) Avail: CFSTI

The results of mass spectrometer analyses of the helium gas released during annealing of production grade, plasma torch fused Pu(238)O2 microspheres are presented for several fuel samples at varying temperatures. Each data set consists of a temperature-time curve, a release rate-time curve, a fractional total release curve, and a diffusion coefficient-time curve. The fractional release curve was obtained by integrating the release rate-time curve, and the diffusion coefficient is calculated from the fractional release curve assuming a simple diffusion model with a time-varying diffusion coefficient. Author (NSA)

N70-29592# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

REACTOR PHYSICS QUARTERLY REPORT, OCTOBER - DECEMBER 1969

Feb. 1970 131 p refs
(Contract AT(45-1)-1830)
(BNWL-1304) Avail: CFSTI

Progress is reported on criticality calculations for water moderated high concentration assembly for isotopes of Am-241, Np-237, Pu-238, Pu-239, and Pu-240; effects of fast neutrons on displacement and swelling of core components for fast test reactors; and physics studies of fuel elements and control rods for fast test reactors. NSA

N70-29649# United Nuclear Corp., Elmsford, N.Y. Research and Engineering Center.

FAST REACTOR MIXED-CARBIDE FUEL ELEMENT DEVELOPMENT PROGRAM Quarterly Progress Report, Apr. - Jun. 1969

16 Sep. 1969 31 p refs
(Contract AT(30-1)-3415)
(UNC-5246; QPR-8) Avail: CFSTI

Summary data are presented on the continuing research to establish mixed carbides as a competitive LMFBR fuel. Among the results reported are the following: (1) The first set of mixed-oxide pellets fabricated for an EBR-2 irradiation was completed successfully to specification. (2) Six fuel rods containing (UPu)C pellets passed a burnup of 50,000 Mwd/T in the EBR-2. (3) Also, in the EBR-2, a 19-rod subassembly (X033) operated at about 20 kw/ft and accumulated 40,000 Mwd/T; the subassembly (X055), composed of UNC 129 through 147, operated at 10 to 15 kw/ft and accumulated 10,000 Mwd/T. (4) Capsules containing one sodium-bonded fuel rod with a 14-in. long fuel length operated at 25 kw/ft in the GETR. (5) Fabrication of the UO2-PuO2 fuel pellet for the subassembly was initiated, and the sintering characteristics of depleted UO2 were determined. S.S.

N70-29651# California Univ., Livermore. Lawrence Radiation Lab.

LITHIUM PROPERTIES RELATED TO USE AS A NUCLEAR REACTOR COOLANT

J. O. Cowles and A. D. Pasternak 18 Apr. 1969 53 p refs
Sponsored by AEC
(UCRL-50647) Avail: CFSTI

Information relevant to the use of Li as a reactor coolant is presented. Topics covered include Li physical and chemical properties, safety and handling consideration, purification and analysis, heat transfer and compatibility with other materials. Author (NSA)

N70-29664# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.

QUANTITATIVE DETERMINATION OF THE STRUCTURE. PROPERTY RELATIONSHIPS IN NUCLEAR FUEL ELEMENT MATERIALS Quarterly Progress Report, 15 Sep. - 15 Dec. 1969

F. N. Rhines, R. T. De Hoff, and L. L. Hench Jan. 1970 79 p refs
(Contract AT(38-1)-552)
(SRO-552-2) Avail: CFSTI

The design and preliminary operation of the devices to be used in sample preparation and property measurements were completed. The permeability apparatus was designed and constructed. The initial measurement of permeability of a porous nickel sample is reported. Dies for presintering tensile bars for room temperature tensile property measurements for nickel were designed and are being fabricated. Sizing of the nickel powder is nearing completion. A qualitative characterization of the UO2 powder, including scanning electron micrographs, is reported. NSA

N70-29681# Hittman Associates, Inc., Columbia, Md.

SPHERICAL CAPSULE TECHNOLOGY PROGRAM: ADDENDUM TO THE HEAT SOURCE TECHNICAL REPORT

Jul. 1970 137 p refs
(Contract AT(29-2)-2475)
(HIT-412) Avail: CFSTI

Work in several phases of the Spherical Capsule Technology Program is reported. The first involved full scale demonstration heat source tests including impact, vibration, and spinning plasma jet testing. The testing program and procedures are described. The impact tests showed that large, thin walled Haynes-188 capsules (with fuel simulant) can withstand impact on a granite surface at velocities greater than predicted reentry terminal velocities and at expected reentry impact temperatures at 1800 F, and resulted in a recommended capsule wall thickness of 0.55 in. The vibration tests showed that: silica foam will not crush even when subjected to loadings in excess of 500 g's; a constant preloading on the various heat source components during the launch environment is desirable and can be accomplished by using a metal felt material or a heat source mounting structure; when this preloading is maintained, the reference heat source design can meet all the Scout launch vehicle vibration specifications. NSA

N70-29682# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.

XE PRIME POWER CONTROL

F. R. Guyer 31 Oct. 1969 26 p Sponsored by AEC
(WANL-TME-1976) Avail: CFSTI

The more salient features of the power control used on the NERVA XE Prime are described. Emphasis is placed to show that the XE Prime power controller met all performance requirements without exception. The stability, bandwidth, and static accuracy were sufficient to permit all of the engine performance maneuvers desired of XE Prime. These included: (1) power holds, (2) power increase and decrease on short and long periods, and (3) power control during bootstrap. Author (NSA)

N70-29683# Argonne National Lab., Ill.

SUMMARY REVIEW OF NEUTRONIC NOISE TECHNIQUES FOR INCIPIENT BOILING DETECTION IN LIQUID METAL FAST BREEDER REACTORS

T. J. Marciniak, L. J. Habegger, and H. Greenspan Jan. 1970 20 p refs
(Contract W-31-109-eng-38)
(ANL-7652) Avail: CFSTI

The state-of-the-art of neutronic noise-boiling detection is reviewed as part of an overall effort to determine the feasibility of developing a system for detecting the onset of boiling in proposed Na-cooled LMFBR cores. It is concluded that feasibility of a Na-boiling detector is within the realm of existing technology but that many problems related to boiling-induced neutron fluctuations, data-gathering, and computer processing of such data, must be resolved before an effective system can be developed. Author (NSA)

N70-29696# Bettis Atomic Power Lab., Pittsburgh, Pa.

CONSEQUENCES OF VARIOUS PROPOSED NUCLEAR DATA

Alan Staub and R. E. Swaja Oct. 1969 6 p refs Presented at Am. Nucl. Soc. Meeting, San Francisco, 30 Nov. – 4 Dec. 1969
(Contract AT(11-1)-GEN-14)
(WAPD-T-2292; CONF-691102-9) Avail: CFSTI

The U-235 fission spectrum was investigated by comparing calculated and experimental values for several quantities. The calculations were performed using the Watt, Harris, ENDF/B, and McElroy spectra. NSA

N70-29698# Westinghouse Electric Corp., Pittsburgh, Pa. Atomic Power Div.

YANKEE CORE EVALUATION PROGRAM Quarterly Progress Report, Period Ending 30 Sep. 1969

30 Sep. 1969 34 p refs
(Contract AT(30-1)-3017)
(WCAP-3017-6091) Avail: CFSTI

The first phase of post-irradiation examination and testing of Yankee Core V Zircaloy-clad UO2 fuel rods was completed. Principal findings are summarized as follows: (1) Irradiation-induced increases in fuel rod length generally fit the pattern of fast neutron fluence dependence of published data. However, the range of fast fluence for the Yankee fuel rods is too small to determine a specific correlation of the Yankee rod length changes. (2) Tensile properties of the Zircaloy clad were independent of fast neutron fluence and test temperature between 625 F and 675 F. The tensile properties were generally consistent with data in the literature. (3) There was no clear correlation between regular burst behavior of Zircaloy and test temperature between 625 F and 675 F. (4) Experimentally determined dynamic burst test failure temperatures for irradiated Zircaloy were between 100 F and 300 F lower than predicted. Quench tests of irradiated Zircaloy clad revealed no spalling or cracking under thermal shock conditions. (5) Continued evaluation of fuel burnup data has reduced, but not eliminated, the discrepancies between results based on heavy element (U and Pu) isotopic measurements and those based on Nd-148 production. Author (NSA)

N70-29699# Oak Ridge National Lab., Tenn. Reactor Div.

FREQUENCY-RESPONSE TESTING OF THE MOLTEN-SALT REACTOR EXPERIMENT

R. C. Steffy, Jr. (M.S. Thesis--Tennessee Univ., Knoxville) Mar. 1970 118 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2823) Avail: CFSTI

Tests to determine the nuetron flux-to-reactivity frequency response were performed on the Molten Salt Reactor Experiment with the reactor at various power levels between zero and full power and with the reactor fueled with a U-235 fuel mixture. Test patterns employed were pseudorandom binary sequences (PRBS) and pseudorandom ternary sequences (PRTS) of various sequence lengths and minimum-pulse-duration times. In some tests reactivity (control-rod position) was forced to follow the test pattern, and in other tests the neutron flux was forced to follow the test pattern. The experimental results were analyzed by several different methods and the results were compared. The frequency response of the uncontrolled reactor system was found to be in good agreement with theoretical predictions for both the U-235 and U-233 fuel loadings. There were no indications of response characteristics that might cause control or safety problems. The power spectra for the various sequences were flat over the expected ranges and variations in the sequence specification changed the power spectra in the expected manner with no anomalous changes. Author (NSA)

N70-29701# Oak Ridge National Lab., Tenn. Technical Information Div.

SHIELDING MEASUREMENTS IN THE RHEINSBERG NUCLEAR POWER PLANT

W. Gerullis et al [1970] 27 p refs Transl. into ENGLISH from Kernenergie (Dresden), v. 12, 1969 27 p
(ORNL-tr-2289) Avail: CFSTI

In the control rooms of the Rheinsberg Power Reactor the mean dose rate equivalent amounts to less than 6% of the permissible value of 1.25 mrem/h. The maximal values with homogeneous shielding are about 1/10 to 1/5 of the value of 1.25 mrem/h, and the dose rate found at irregularities is 0.1 to 6 mr/h. The present safety factors can be reduced by improved and further developed design principles, more exact calculations of the source strengths, refined calculation methods for determining the thicknesses of shielding, as well as choice of the best types of concrete and concrete technology. Further reductions in cost are possible if local peakings are permitted at irregularities. Unfortunately, up to the present, even internationally, there have been no uniform concepts concerning the permissible peaking of the dose rate. Author (NSA)

N70-29711# United Nuclear Corp., Elmsford, N.Y. Research and Engineering Center.

FAST REACTOR MIXED-CARBIDE FUEL ELEMENT DEVELOPMENT PROGRAM Quarterly Progress Report, Oct. – Dec. 1968

1 Apr. 1969 39 p
(Contract AT(30-1)-3415)
(UNC-5238; QPR-6) Avail: CFSTI

Results of a program aimed at the establishment of mixed carbides as a competitive LMFBR fuel are presented. Accomplishments reported include: (1) Four sodium-bonded mixed carbide fuel rods were inserted into the GETR and are operating as designed at 25 kw/ft. (2) Mixed carbide unrestrained swelling and fission gas release experiments were assembled satisfactorily and shipped for irradiation. (3) The fabrication of all mixed carbide fuel rods for the low power EBR-2 subassembly was completed. (4) Post-irradiation examination of nine helium bonded, high-density mixed-carbide pellet specimens indicated eight intact, including an Incoloy-800 clad specimen with a 0.003-in initial diametral gaps. The ninth specimen, having Type 316 clas and a 0.002-in gaps, had three cracks. The rods were irradiated up to 40,000 Mwd/T at 28 kw/ft. D.L.G.

N70-29718# Bettis Atomic Power Lab., Pittsburgh, Pa.

AN ANALYTICAL STUDY OF THE MINIMUM CRITICAL MASS OF HIGHLY ENRICHED U 235 WHEN REFLECTED BY NATURAL URANIUM AND WATER MIXTURES IN OPTIMIZED LATTICES

A. W. Gray and L. L. Jones Mar. 1970 52 p refs
(Contract AT(11-1)-GEN-14)
(WAPD-TM-933) Avail: CFSTI

An extensive analytical study has been undertaken to add to the limited data available concerning the minimum critical mass parameters for a spherical region of an optimum U235-plus-water mixture, when this region is reflected by natural U in an optimum light-water configuration. The conditions under which the central, enriched region would be exactly critical, with a minimum critical mass of U235, have been computed for various reflector configurations. These reflector configurations are: a homogeneous mixture of water and natural U at the optimum H to U235 ratio; and natural U metal cylinders in an optimum U-water lattice. Specific calculations were performed in this latter system for 0, 225, and 17,000 Kg of natural U. The results of these calculations indicate that the minimum critical mass parameter for the central enriched region lies in the range of 75 to 200 grams of U235. The heterogeneous systems were analyzed using a Monte Carlo program. The validity of this analysis was established by application of the Monte Carlo program to a number of U-rod-water lattice system (U235 enrichment in the range 0.71 to 3.0 w/o) for which experimental data is available. These results were then utilized to select appropriate criticality limits and rules for the underwater handling of natural and enriched U materials under conditions when both types of materials are available. Author (NSA)

N70-29785# Bettis Atomic Power Lab., Pittsburgh, Pa.

AN ANALYSIS OF TRANSIENT CLAD STRAINS IN CYLINDRICAL FUEL ELEMENTS INCLUDING THE EFFECTS OF OXIDE PELLET CRACKING (STRIPE). LWBR DEVELOPMENT PROGRAM

W. J. O'Donnell, W. G. Clarke, and W. R. Campbell Feb. 1970 58 p refs
(Contract AT(11-1)-GEN-14)
(WAPD-TM-652) Avail: CFSTI

An analysis of the deformations imposed on the cladding of cylindrical fuel elements by differential thermal expansions during an abrupt reactor power increase is presented. The effects of pellet cracking are included in the analysis and are found to be very significant. The analytical model also includes the effects of temperature-dependent material properties, possible pellet-to-cladding gaps, compressive plastic flow in the hot inner core of the pellet, and tensile yielding of the cladding. The solution was programmed in FORTRAN 4 for the CDC-6600 digital computer as STRIPE (MO650). Calculated results are compared with experimental results obtained on UO2 fuel rods irradiated at Chalk River. Good agreement was found over a very wide temperature range. NSA

N70-29786# Atomic Energy Commission, Aiken, S.C. Savannah River Operations Office.

REPROCESSING OF NPR FUEL AT NUCLEAR FUEL SERVICES, INC., WEST VALLEY FACILITY

Feb. 1970 94 p
(Contract AT(38-1)-344)
(SRO-344-4) Avail: CFSTI

The first five months of reprocessing experience at Nuclear Fuel Services is summarized, and specific data relative to processing operations, analytical laboratory operations, and nuclear materials accountability are included. NSA

N70-29864*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STARTUP TESTING OF THE SNAP-8 POWER CONVERSION SYSTEM

Herbert G. Hurrell, Fred Boecker, Jr., and Kent S. Jefferies [1970] 14 p refs
(NASA-TM-X-52822) Avail: CFSTI CSCL 18N

SNAP-8 development has included extensive startup testing of the power conversion system coupled with a reactor simulator. Data are presented that show the power conversion system can be started in a dependable way. The temperature transients are well within the limits specified for the reactor. Procedures are discussed for the relatively fast transient to self-sustained operation and for the more gradual transient that achieves rated power output. Author

N70-29883# Oak Ridge National Lab., Tenn.

ANNUNCIATOR SCAN PROGRAM FOR THE HFIR DIGITAL CONTROL AND DATA ACQUISITION

J. B. Bullock and H. P. Danforth 9 Feb. 1970 23 p ref
(Contract W-7405-eng-26)
(ORNL-TM-2837) Avail: CFSTI

The on-line digital computer at the HFIR is programmed to scan each of the safety related annunciators every 200 msec and list the name and time of occurrence of each alarm. The program logic is described and detailed program listings are included. Author (NSA)

N70-29887*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CALORIMETRIC DETERMINATION OF RELATIVE GAMMA HEATING IN MATERIALS OF VARIOUS THICKNESSES AND ATOMIC NUMBERS

Harry J. Reilly and Larry E. Peters, Jr. Washington May 1970 10 p refs
(NASA-TM-X-2019; E-5587) Avail: CFSTI CSCL 18D

A calorimeter was constructed to determine the relative amount of gamma heating in different materials as a function of thickness and atomic number. The experiment was performed in the Plum Brook Mockup Reactor, which has a typical light water test reactor gamma source spectrum. Carbon, aluminum, zirconium, tin, and lead specimens in slab geometry were irradiated. The results showed no significant difference in the gamma heating in carbon and aluminum, but the heating in the other materials was greater than that in carbon and aluminum. The smaller thicknesses had the greater heating. The results are believed to be applicable to nuclear reactor experiment designs and to other reactor problems as well. The calorimeter was also used to determine the gamma heating effect in an irradiation experiment mockup having cylindrical geometry. The result showed good agreement with an expected value calculated from the slab geometry data. Author

N70-29973# Wolf Management Services, Palo Alto, Calif.

APPLICATION OF ADVANCED DYNAMIC PROGRAMMING COMPUTATIONAL PROCEDURES TO THE PLANNING OF NUCLEAR FUEL REPROCESSING PLANTS AND NUCLEAR POWER REACTORS Final Report

R. E. Larson and F. J. Rees Nov. 1969 68 p refs Prepared for Oak Ridge Natl. Lab.

(TID-25349) Avail: CFSTI

Presented are the results of a project to assess the feasibility of applying advanced dynamic programming computational procedures to two planning problems of concern to the Atomic Energy Commission, namely the planning of nuclear power reactor types and the planning of nuclear fuel reprocessing plants. In both cases the feasibility was assessed by solving low-dimensional problems that have all the characteristics of the realistic problem. As a result of this study, algorithms that show considerable promise in the realistic, high-dimensional reactor planning problem have been developed. In the case of reprocessing plant problems, algorithms are now available that can be extended to the realistic high-dimensional problem. Author (NSA)

N70-29978# Los Alamos Scientific Lab., N.Mex.

UNIT CELL OF THE ZETA PHASE OF THE PLUTONIUM-ZIRCONIUM AND THE PLUTONIUM-HAFNIUM SYSTEMS

W. H. Zachariasen and F. H. Ellinger 26 Jan. 1970 4 p refs
(Contract W-7405-eng-36)
(LA-4367) Avail: CFSTI

The unit cell of the isostructural Pu - Zr and Pu - Hf zeta phases was found to be body-centered tetragonal with a = 18.19 + or - 0.01 A and c = 7.851 + or - 0.003 A. Author (NSA)

N70-29981# Atomic Power Development Associates, Inc., Detroit, Mich.

[SODIUM TECHNOLOGY AND HETEROGENEITY ANALYSIS] Quarterly Technical Progress Report, Jul. Sep. 1969

Sep. 1969 54 p refs
(Contract AT(11-1)-865)
(APDA-248) Avail: CFSTI

Tube wastage by sodium water reactions in steam generators is analyzed. Test results for for Cr Mo steel are presented. Test programs and results for the prototype Rhometer automatic temperature compensator in a liquid Na loop are described. A comparison of methods for calculating and measuring heterogeneity effects in fast reactor critical assemblies and power reactors is presented. NSA

N70-29993*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EVALUATION OF CRITICAL MASS FOR OPEN-CYCLE, GAS-CORE ROCKET REACTORS

Robert E. Hyland
(NASA-TM-X-52820; E-5707) Avail: CFSTI CSCL 18E

A nuclear analysis using transport theory was made of an open-cycle gas-core reactor for assumed operating conditions. Calculations were made for cavity diameters from 8 to 16 feet, for hydrogen (cavity) bypass variation from 0 to 99 percent, for reflector thickness from 2 to 3.5 feet, and for both isotopes U-235 and U-233 as fuel. For these configurations the results indicated that U-233 and some low enough to give system pressures of less than 1000 atmospheres. Author

N70-29998# Atlantic Richfield Hanford Co., Richland, Wash.

CERAMIC PROPERTIES OF PuO2

O. R. H. Rasmussen 25 Mar. 1969 37 p refs
(ARH-1153) Avail: CFSTI

Reported research shows that plutonium dioxide made via the plutonium-IV oxalate precipitation and calcination process appears to be a highly sinterable powder. A calcination temperature of 750 C yields the most suitable oxide powder obtainable from plutonium oxalate for blending with UO2 in the production of UO2 PuO2 fuel pellets. The most efficient method of blending large quantities of UO2 and PuO2 powders appears to be V-blending followed by dry ball milling or hammermilling. For blending of small quantities of mixed oxides, wet ball milling has been found effective. Sintering PuO2 in an oxidizing atmosphere such as air yields higher densities than sintering in a reducing or inert atmosphere. When PuO2 is sintered in a reducing atmosphere such as Ar 6% H2, a sintering temperature of 1400 to 1500 C yields maximum densities. NSA

N70-30002*# Aerojet-General Corp., Azusa, Calif. Power Systems Div.

EXPERIMENTAL INVESTIGATION OF THE SNAP-8 MERCURY RANKINE-CYCLE POWER CONVERSION SYSTEM

J. M. Hodgson Dec. 1969 102 p refs
(Contract NAS5-417)
(NASA-CR-72679; Rept-AERO-3657) Avail: NASA Scientific and Technical Information Facility, P. O. Box 33, College Park, Md. 20740

A breadboard of the SNAP-8 nuclear-electric space power system was tested to determine the operating characteristics of the SNAP-8 power conversion system. Component-system interactions, component performance, transient behavior, and system problem areas were identified and evaluated. The feasibility of SNAP-8 as a Rankine cycle, space power system has been demonstrated. Author

N70-30003*# Aerojet-General Corp., Azusa, Calif.

DEVELOPMENT OF A 60 kw ALTERNATOR FOR SNAP-8

M. G. Cherry and J. R. Pope Nov. 1969 34 p refs
(Contract NAS5-417)
(NASA-CR-72669; Rept-3652) Avail: NASA Scientific and Technical Information Facility, P. O. Box 33, College Park, Md. 20740

The design philosophy, the mechanical and electrical design, and the development testing of an 80 KVA alternator driven by a mercury vapor turbine in the SNAP-8 mercury Rankine cycle are described. The alternator was designed using the latest technology compatible with high reliability, long life, and good performance. Development tests on several alternators, including running time on one unit in excess of 19,000 hours at design conditions, have verified the design concept and demonstrated endurance capabilities exceeding the original objectives. Author

N70-30004# Comitato Nazionale per l'Energia Nucleare, Rome (Italy).

STUDY OF THE INTERACTIONS BETWEEN SODIUM, CERAMIC AND FISSION PRODUCTS [STUDIO SULLE INTERAZIONI TRA SODIO, CERAMICO E PRODOTTI DI FISSIONE]

G. J. Segre 1969 73 p refs In ITALIAN; ENGLISH summary
(RT/ING(69)8) Avail: CFSTI

An experimental program on the sodium, ceramic material and fission products interactions, connected both with the needs of the safety and the development of a ceramic fuel and the fundamental requirements, is outlined. The work is centered on the sodium-ceramic material compatibility and on the release, distribution, chemical state and analysis of the fission products, the experiments suitable to increase the knowledge of these points, are described and analyzed in their dependence from the most significant parameters. Author

N70-30026# Atomics International, Canoga Park, Calif.

LMFBR SAFETY PROGRAMS Quarterly Technical Progress Report, Oct. Dec. 1969

15 Feb. 1970 14 p ref
(Contract AT(04-3)-701)
(AI-AEC-12912) Avail: CFSTI

The approximation solution of the heterogeneous aerosol agglomeration model programmed as HAA-3 was modified to correctly compute the decrease in airborne particulates when the log-normal approximation fails. The constant input source term was modified so that time variable functions could be studied. The approximation solution of the heterogeneous aerosol agglomeration model was extended to include the optimal use of the Klyachko velocity correction to Stokes law. A preliminary spray-fire model was developed which aids in interpreting the experimental adequacy of the measured parameters such as oxygen concentration and wall temperature as a function of time in the spray test vessel. Author

N70-30108# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.

SNAP-23A, PHASE 1 Quarterly Progress Report, 1 Sep. - 30 Nov. 1969

W. S. Wilgus Jan. 1970 116 p refs
(Contract AT(30-1)-3800)
(WANL-3800-41; WANL-PR(SS)-34; QPR-11) Avail: CFSTI

Research and development are reported in sections on program management, product assurance, materials and component testing, systems development, and safety analysis. NSA

N70-30139# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorbauelemente.

INVESTIGATION OF INTERNALLY AND EXTERNALLY FINNED, TUBULAR, GAS COOLED NUCLEAR FUEL ELEMENTS [UNTERSUCHUNG INNEN UND AUSSEN BERIPPTER, ROHRFOERMIGER, GASGEKUEHLTER BRENNELEMENTE]

K. H. Presser, R. Harth, and P. Broeckerhoff Oct. 1969 76 p refs In GERMAN
(Contract EURATOM-062-65-TEGD)
(JUL-618-RB) Avail: CFSTI

Measurements were carried out on several internally and externally finned, cooled, tubular fuel elements for a natural uranium/graphite/gas reactor. Mean and local heat transfer and pressure loss coefficients were measured under reactor conditions for seven tubes with longitudinal, transverse, and "herringbone" cooling fins. ESRO

N70-30163# Atomics International, Canoga Park, Calif.

LMFBR PHYSICS PROGRAMS Quarterly Technical Progress Report, Oct.-Dec. 1970

15 Feb. 1970 30 p
(Contract AT(04-3)-701)
(AI-AEC-12911) Avail: CFSTI

The series of experiments in which the reactivity worth of tantalum was established over a large range of surface-to-mass values for solid cylinders was used to derive a normalization factor for calculating the reactivity control afforded by a typical FBR control rod. This series of experiments was extended during this reporting period to include more exact control rod mockups. A pin-type test zone that is a very close geometrical and physical simulation of a full scale FBR core was designed and is nearing completion of fabrication. Studies in this core will reduce uncertainties in typical measured core parameters, uncertainties that may be inherent in the more common plate-type heterogeneous systems. Author

N70-30178# General Electric Co., Schenectady, N.Y. Knolls Atomic Power Lab.

TIME DOMAIN NOISE MEASUREMENTS IN LOOSELY COUPLED CORES

J. A. Burke, W. E. Moore, R. A. Rydin, and K. W. Seemann 21 Mar. 1970 42 p refs Presented at the Symp. on Dyn. of Nucl. Systems, Tucson, Ariz., 23-25 Mar. 1970
(Contract W-31-109-eng-52)
(KAPL-P-3873; Conf-700304-4) Avail: CFSTI

A method for estimating the eigenvalue separation of a reactor from cross correlation measurements of neutron fluctuations in two different parts of the core is presented. The SHA critical assembly is used to verify the results. Author (NSA)

N70-30234# Sandia Corp., Albuquerque, N.Mex.

DYNAMIC ANALYSIS OF SIMULATION TECHNIQUES FOR FUEL DISC EARTH IMPACT

T. A. Duffey Jan. 1970 25 p ref Sponsored by AEC
(SC-DR-69-848) Avail: CFSTI

Two techniques currently used to simulate the earth impact of exposed fuel discs are modeled in one-dimensional strain. A linear elastic constitutive relation and simple graphical constructions are used to crudely examine the first few stress wave-interface reactions in each of the two impact simulation schemes. It is shown that both schemes are equally valid simulations for the special case in which target and fuel containment materials are identical. If target and container are constructed of dissimilar materials, as will generally be the case, it is shown that only one of the testing techniques is an exact simulation. Author (NSA)

N70-30235# Oak Ridge National Lab., Tenn.

ORNL NUCLEAR SAFETY RESEARCH AND DEVELOPMENT PROGRAM Bimonthly Report, Nov.-Dec. 1969

William B. Cottrell Mar. 1970 156 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2829) Avail: CFSTI

Much of the work is in general support of water-cooled power reactor technology, including LOFT and industry programs, and reflects current safety problems, such as measurements of prompt fuel element failure phenomena and the efficacy of containment-spray and pool-suppression systems for fission product removal. Also included are studies on the release and behavior of accident-released fission products, as well as the removal of these fission products and aerosols from gas streams by filters and adsorbers. Several projects are also conducted in support of the High-Temperature Gas-Cooled Reactor (HTGR) and Liquid-Metal Fast Breeder Reactor (LMFBR) programs. Other major projects include studies of primary piping and steel pressure-vessel technology. Experimental work relative to pressure-vessel technology includes investigations of the attachment of nozzle to shells and the implementation of joint AEC-PVRC programs on heavy-section steel technology and nuclear piping, pumps, and valves. Several of the projects are directly related to the AEC standards program. Author

N70-30265# Oak Ridge National Lab., Tenn. Chemical Technology Div.

UNIT OPERATIONS SECTION Quarterly Progress Report, Apr.-Jun. 1968

Feb. 1970 64 p refs
(Contract W-7405-eng-26)
(ORNL-4365) Avail: CFSTI

Progress is reported on operations used in a close-coupled processing facility for removing fission products, corrosion products, and fissile materials from the molten fluoride mixture; development of sol-gel processes for use in preparing ceramic nuclear fuels; the separation of phenylalanine and tyrosine tRNAs; and the separation of methionine and valine tRNAs. NSA

N70-30271# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.

OXIDE FUEL ELEMENT DEVELOPMENT Quarterly Progress Report, Period Ending 30 Sep. 1969

Nov. 1969 106 p refs
(Contract AT(30-1)-4135)
(WARD-4135-1) Avail: CFSTI

Parametric studies covering a range of linear powers and three fuel swelling models were conducted, using the present form of the code. Correlation of secondary creep rate data for 316 cold worked and solution treated stainless steels was completed. Irridation-induced creep analysis was continued, and preliminary correlations were established. A fuel thermal conductivity relationship was developed to improve temperature profile calculations required for performance analyses. The thermal, nuclear, and mechanical designs, including all drawings and design analyses, were completed for the 19-capsule subassembly. A parametric study of resistance spot welding parameters to determine conditions yielding maximum strength with minimum grid distortion was completed. Initial tests indicate that Al2O3 grinding media is preferred to WC. Initial pressing and sintering trials with UO2 were conducted to determine the range of parameters for preparing high density PuO2 UO2 pellets and for preparing the UO2 insulator pellets for the grid-subassembly test. Author (NSA)

N70-30273# Sandia Corp., Albuquerque, N.Mex.

COUPLED KINETIC-ELASTICITY CALCULATIONS OF PULSED REACTOR PERFORMANCE

J. A. Reuscher 13 Mar. 1970 9 p refs Presented at the Symp. on Dyn. of Nucl. Systems, Tucson, Ariz. Sponsored by AEC
(SC-DC-70-4753; Conf-700304-2) Avail: CFSTI

A calculational procedure which uses numerical techniques is described for determining the pulse profile, the fuel temperature rise, and the elastic response characteristics of the fuel element of pulsed reactors. NSA

N70-30274# Oak Ridge National Lab., Tenn.

HIGH FLUX ISOTOPE REACTOR Quarterly Report, Oct. - Nov. 1969

R. V. Mc Cord and B. L. Corbett 5 Mar. 1970 18 p
(Contract W-7405-eng-26)
(ORNL-TM-2911) Avail: CFSTI

An unusual number of shutdowns was experienced at the high flux isotope reactor. Ten schedules and six unscheduled shut-downs were recorded. Despite the downtime accumulated during the last two quarters of the year, the operating time for 1969 was 90.7%. Two of the unscheduled shutdowns resulted from mechanical failures. One long shutdown was caused by a failure in the mechanical coupling of the only operable main pressurizer pump. Another shutdown and fuel changeout was required when the primary coolant strainer basket failed. Author (NSA)

N70-30290# General Electric Co., Schenectady, N.Y. Knolls Atomic Power Lab.

AN EXPERIMENTALLY MEASURABLE RELATIONSHIP BETWEEN ASYMPTOTIC FLUX TILTS AND EIGENVALUE SEPARATION

David C. Wade and Roger A. Rydin 21 Mar. 1970 22 p refs Presented at the Symp. on Dyn. of Nucl. Systems, Tucson, Ariz.
(Contract W-31-109-eng-52)
(KAPL-P-3872; Conf-700304-3) Avail: CFSTI

A standard perturbation theory analysis for a few group diffusion theory reactor models is used to obtain a model expansion for the asymptotic flux distribution following the introduction of a material perturbation. The modal coefficients are interpreted in terms of the physical meaning of the harmonic adjoint eigenfunctions. Neglecting all harmonic components after the first, it is found that the fundamental to first harmonic eigenvalue separation may be determined by the slope in a plot of perturbing reactivity versus a particular measure of the asymptotic flux tilt. The accuracy of the relationship is shown to be good over a large range of models and for various experimental configurations of the Solid Homogeneous Assembly (SHA). Author (NSA)

N70-30299# Oak Ridge National Lab., Tenn.

THORIUM FUEL CYCLE DEVELOPMENT Progress Report, Feb. 1970

Mar. 1970 30 p ref
(Contract W-7405-eng-26)
(ORNL-TM-2886; PR-7) Avail: CFSTI

Research and development are reported on head-end reprocessing, refabrication, materials irradiation, and U-233 reprocessing. NSA

N70-30306# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.

MICROSPHERE HANDLING TECHNIQUES

F. J. Furman, J. T. Meador, and J. D. Sease Mar. 1970 26 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2782) Avail: CFSTI

Devices and techniques for remotely transferring, storing, classifying, blending, and inspecting 150- to 850 micron-diam microspheres were developed. Particles are transferred both pneumatically and by gravity and routed by air-operated valves. Storage hoppers feed into the transfer system. Classification is by both size and shape. Large batches are blended by pneumatic stirring and small batches by concurrent pouring at a precise ratio. Particle size is inspected by both automatic and manual optical methods. Author (NSA)

N70-30308# Argonne National Lab., Ill.

THE MANUFACTURE OF VIBRATORILY COMPACTED FUEL ELEMENTS FOR DOPPLER-COEFFICIENT MEASUREMENTS

J. E. Ayer, C. F. Konicek, F. E. Soppet, and E. J. Petkus Jan. 1970 14 p refs
(Contract W-31-109-eng-38)
(ANL-7647) Avail: CFSTI

The procedures that are used to manufacture and assemble vibratorily compacted oxide fuels containing plutonium, depleted uranium, and uranium-233 materials are described. Thirty-two acceptable, low-density, fuel rods were made with loadings of 100% PuO2, 100% U23302, and various blends of U238O2-PuO2. The granules for loading were prepared by tableting the respective oxide powder, granulating, firing, and sieving for the proper size range. Over 21 kg of dense, sintered granules were then loaded into the elements by vibratory compaction to densities ranging from 50.8 to 57.8 % of theoretical. Fourteen elements were 1/2 in. in diameter and 18 were 1 in. in diameter; the jackets of six elements were made of Invar and the remaining 26 were Inconel. During in-pile testing, the elements are to be heated by resistance wire that is wrapped around the element. The longitudinal expansion of the elements during heating is accommodated by either a sliding seal or by spring loading on the exterior of the element. Eight of the elements have a sliding seal, whereas the remaining 24 are spring loaded. Author (NSA)

N70-30309# Battelle-Northwest, Richland, Wash. Fuels and Materials Dept.

USAEC/AECL COOPERATIVE PROGRAM ON U3 Si COEXTRUSION DEVELOPMENT AND BILLET PREPARATION, 1968 - 1969

P. A. Ard Feb. 1970 80 p refs
(Contract AT(45-1)-1830)
(BNWL-1212) Avail: CFSTI

Programs on U3Si coextrusion and U3Si billet preparation are described. Efforts to develop technology for coextrusion of zirconium alloy clad fuel rod stock with small central axial holes to accommodate radiation induced swelling, and to develop alternate methods for producing case uranium silicon alloy billets with a fine uranium and U2Si2 microstructure necessary for reducing the deltizing heat treatment time are summarized. Several 0.600-in OD coextrusions with small 0.200-in OD coextrusions with small 0.200-in dia central coaxial holes were produced from 2.25-in. billets containing castings of uranium silicon alloys with compositions of

U-3.6 wt% Si to U-4.15 wt% Si. The U3Si material was successfully coextruded with both Zr-2 and Zr-2.5Nb cladding materials. Several 3-in. dia coextrusion billets were extruded at reductions of from 15.7/1 to 21/1, and at extrusion ram speeds of 40, 60, and 120 in./min. Author (NSA)

N70-30313# Oak Ridge National Lab., Tenn.

ORNL EXPERIMENTS ON THE BEHAVIOR OF TRITIUM DURING HEAD-END PROCESSING OF IRRADIATED REACTOR FUELS

J. H. Goode and V. C. Vaughen Feb. 1970 25 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2793) Avail: CFSTI

The behavior of tritium, a ternary fission product having an approximate 0.01% yield, was investigated in hot-cell tests of several pre-solvent extraction operations for power reactor fuel processing using various oxide and carbide specimens. Generally, less than 5% of the calculated yield of tritium was found in samples of fuel rods that had been operated at linear heat ratings greater than about 3 to 4 kw/ft. Further efforts to determine the fate of the remaining tritium, both during irradiation and fuel reprocessing, are planned. Author (NSA)

N70-30370# Comitato Nazionale per l'Energia Nucleare, Rome (Italy). Lab. Fisica e Calcolo Reattori.

POWER DISTRIBUTIONS AND REACTIVITY VALUES CALCULATED FOR DIFFERENT PATTERNS IN A UO2-PuO2 MICROLATTICE

F. Orestano and F. Pistella 1969 72 p refs
(RT/FI(69)49) Avail: CFSTI

The results are reported of calculations performed for different patterns of a UO2-PuO2 microlattice irradiated in the RITMO reactor. The patterns were designed to investigate the effects due to the water gaps and control rods present in power reactors. The calculated space distributions of power and spectral indexes are presented for comparison with the values measured by gamma-scanning the pins or by activating detector foils within the pins. In addition fine distributions within the fuel cell are presented. The Pu-239 absorption rate is also evaluated by applying a correlation method to suitable spectral indexes. Author

N70-30391# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).

THE EXPERIMENTAL INVESTIGATION OF A LOCAL (SPOT) HEAT TRANSFER COEFFICIENT IN THE FUEL SPACERS AREA

Jiri Vlcek et al [1968] 12 p refs Transl. into ENGLISH from Jad. Energ. (Czechoslovakia), v. 14, 1968 p 419-425 In ENGLISH and CZECHOSLOVAKIAN
(LIB/Trans-250) Avail: AEC Depository Libraries

Results of a heat-transfer experiment in annuli with different spacers are reported. A review of this problem, derivation of basic equations, description of experimental devices, and some results are presented. The experimental data utilization and extension for both power design of nuclear reactor fuel elements and hot spot factors analyses are discussed. Author (NSA)

N70-30407# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Elektrische Antriebe und Energieversorgung.

POSSIBLE SPACE APPLICATION OF NUCLEAR POWER SUPPLY, PARTICULARLY FOR DIRECT TV-BROADCASTING [EINSATZMOEGLICHKEITEN EINER NUKLEAREN ENERGIEVERSORGUNGSANLAGE IN DER RAUMFAHRT, INSBESONDERE FUER DIE FERNSEHDIREKTUEBERTRAGUNG]

W. Rasch, W. Kleinkauf, U. Krupstedt, A. Quast, and W. Scharf Apr. 1970 393 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-W-70-16) Avail: CFSTI; Zentralstelle fuer Luft Fahrtdokumentation und Inform. (ZLDI), Munich: 82 DM

Space application of an Incore-Thermionic-Reactor (ITR) is demonstrated by a direct broadcasting satellite. The electric power of the reactor (30 kW) is applied to the transmission of two TV-programs in the 800 MHz range using vestigial sideband modulation (5 kW transmission power for Central Europe). In addition, a 12 GHz broadcast is discussed. During the orbit transfer, the reactor supplies four Kaufman ion thrustors. The main components of the satellite, (power supply with a advanced cooling system, low voltage converter, electric propulsion system, and TV-payload) are described. Author (ESRO)

N70-30426# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

ANALYSIS OF FTR PHASE B CRITICAL EXPERIMENTS. PART 2: ZPR-3 ASSEMBLIES 52a, b, c, d, e, AND f

W. R. Young and R. A. Bennett Feb. 1970 50 p refs
(Contract AT(45-1)-1830)
(BNWL-1139-Pt-2) Avail: CFSTI

Critical experiments in support of the design of the Fast Flux Test Reactor have been carried out in ZPR-2 Assemblies 48, 48A, 51, and 52a, b, c, d, e, and f. The results and analysis of the experiments performed in Assemblies 52a, b, c, d, e, and f are presented. Author (NSA)

N70-30461# Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia).

CONSTRUCTION AND PERFORMANCE OF THE LIQUID METHANE COLD SOURCE

V. Dimic and J. Petkovsek Jan. 1970 14 p refs
(IJS-R-574) Avail: CFSTI

A liquid methane cold neutron source has been installed in one of the tangential beam tubes of the reactor Triga Mark 2. The design and construction of the cooling system and cold source assembly is outlined in detail. With a source such as described, a reliable and continuous operation can be achieved. Author

N70-30463# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Chemische Technologie.

THE THERMOCHEMISTRY OF U, Th, Pa, C, O2, Cl2 [ZUR THERMOCHEMIE DER STOFFSYSTEME U, Th, Pa, C, O2, Cl2]

Josef Krahe and Franz Mueller Dec. 1968 40 p refs In GERMAN
(JUL-565-CT) Avail: CFSTI

The operational techniques of chlorinated volatilization as a recovery or hydrolizing process for fuel elements of the THT reactor are described. The thermochemical bases of chlorinated volatilization procedures are presented in the form of various phase diagrams and the estimated boundaries of the phase fields are represented by broken lines in the diagrams. Transl. by R.B.

N70-30477# Comitato Nazionale per l'Energia Nucleare, Rome (Italy).

SIMULATION OF HETEROGENEOUS PLUTONIUM WITH EUROPIUM IN A URANIUM MICROLATTICE [SIMULAZIONE ETEROGENEA DEL PLUTONIO CON EUROPIO IN A MICRORETICOLI A URANIO]

F. Orestano and F. Pistella 1969 81 p refs In ITALIAN
(RT/FI(69)23) Avail: CFSTI

The features of a natural uranium fuelled lattice containing europium have been defined in order to mock-up - as far as the neutron spectrum is concerned - a reference plutonium fuelled lattice. The results of calculations are reported for the irradiation

experiment of the europium lattice in the RITMO reactor. For different patterns of the lattice detailed calculations of power distributions as well as of spectral index distributions have been performed.
Author

N70-30503# Oak Ridge National Lab., Tenn. Div. of Reactor Development and Technology.

FUELS AND MATERIALS DEVELOPMENT PROGRAM Quarterly Progress Report, Period Ending 30 Sep. 1969

P. Patriarca, comp. and D. J. Rucker, ed. Feb. 1970 314 p refs

(Contract W-7405-eng-26)

(ORNL-4480) Avail: CFSTI

Research progress reported includes the following areas of investigation: (1) nondestructive testing techniques for LMBR; (2) corrosion studies of advanced refractory metals; (3) fabrication development for LMFBR stainless steel tubing; (4) welding development for LMFBR vessels and components; (5) physical and mechanical metallurgy of refractory alloys; (6) cladding materials for space isotopic heat sources; (7) mechanical properties of alloys in reactor environments and development of LMFBR cladding and structural materials; (8) development of fast-reactor neutron-absorber materials; (9) development of fuel element fabrication; (10) development of fast-reactor oxide fuels; (11) fast-neutron irradiation effects on electrical insulators; (12) Fission-gas release and physical properties of fuel materials during irradiation; (13) behavior of refractory materials under irradiation; and (14) LMFBR fuel element design and model development.
D.L.G.

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics; 20 Meteorology; and 29 Space Radiation.

N70-29209 New York Univ., N.Y.

PARAMAGNETIC RESONANCE IN THE PARALLEL FIELD CASE

Allan Abraham Harkavy (Ph.D. Thesis) 1967 107 p

Avail: Univ. Microfilms: HC $5.40/Microfilm $3.00 Order No. 69-21047

A spin absorption experiment on a large number of manganese powders was carried out. Three types of spectra were observed with the parallel configuration: (1) a single resonance line at the Larmor frequency, (2) resonance lines at both the fundamental and second harmonic of the Larmor frequency, and (3) resonance lines plus a nonresonant absorption due to adiabatic susceptibility. It was found that Caspers' theory was generally successful in explaining the data especially when the exchange interaction was not too large and the axial crystal field was present. In order to explain a narrow first Larmor line in the parallel case when the exchange interaction was large, an extended hyperfine interaction is proposed which includes the normal hyperfine interaction and that between the nucleus of one magnetic ion and magnetic electrons of the adjacent magnetic ions. Dissert. Abstr.

N70-29243 Carnegie-Mellon Univ., Pittsburgh, Pa.

THE INTERACTION BETWEEN A CONDUCTING FLUID AND A MAGNETIZED SPHERE FOR AN ARBITRARY MAGNETIC REYNOLDS NUMBER

Allan Roy Bishop (Ph.D. Thesis) 1968 199 p

Avail: Univ. Microfilms: HC $9.00/Microfilm $3.00 Order No. 69-6583

The distortion of a magnetic field by the flow of an inviscid, incompressible, conducting fluid over a perfectly conducting sphere is determined using the Galerkin method of trial functions. Undisturbed potential flow around the sphere is assumed. The two dimensional problem of a dipole magnetic field with its axis aligned with the free-stream velocity is investigated. The three dimensional problems of a uniform magnetic field perpendicular to the free-stream velocity and of a dipole magnetic field with its axis perpendicular to the free-stream velocity are investigated. Solutions to these indicate that the magnetic field is dragged to the sides of the sphere by the fluid, and that this effect is more pronounced as the magnetic Reynolds number is increased. Appreciable electric current is generated in the fluid, particularly for the dipole magnetic field. Dissert. Abstr.

N70-29259 Polytechnic Inst. of Brooklyn, N.Y.

THE ELECTROMAGNETIC FIELDS OF A SOURCE-EXCITED, PERIODICALLY-STRATIFIED MEDIUM

Barry M. Singer (Ph.D. Thesis) 1969 193 p

Avail: Univ. Microfilms: HC $8.80/Microfilm $3.00 Order No. 69-20367

The study of the electromagnetic properties of a periodically-stratified medium is divided into two main parts: (1) plane wave excitation of electromagnetic fields; and (2) line source excitation of electromagnetic fields. In both cases the electric field polarization is normal to the plane of incidence. In part 1 various methods of solution to a plane wave incident on infinite and semi-infinite sinusoidally modulated media are considered. Included are the W.K.B. or geometrical optical method and the rigorous solution of Mathieu's equation by the continued fraction method. In part 2 the formal expression for the field of a line source embedded in an infinite medium whose dielectric constant is sinusoidally modulated is found. Complete results for the far field are obtained by evaluating the resulting integrals by the method of steepest descent. The fields are shown to exhibit diffraction effects whose dominant components are explainable in terms of a Bragg type of propagation mechanism. The results are particularly significant and accurate when the wavelength of the modulated medium is of the same order of magnitude as the electromagnetic wavelength.
Dissert. Abstr.

N70-29301# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.

RULED GRATINGS FOR X-RAY AND ULTRAVIOLET SPECTRA Final Report, 1 Apr. 1967 - 30 Sep. 1969

J. Alvin Bearden 21 Nov. 1969 37 p refs

(Contract F19628-67-C-0200)

(AD-700352; AFCRL-69-0524) Avail: CFSTI CSCL 20/6

A new process for making ruled gratings is described. A protective film of molybdenum and gold of about 300 A is sputtered on blanks of glass or quartz. A sharp pointed diamond properly loaded is used to cut a fine ruling through the protective film and slightly into the blank. Hydrofluoric acid is then used to etch a groove of the required depth and width. The grating is then coated with a reflectance coating of gold or platinum to increase its efficiency. With close control of the ratio of flat to groove width, one should be able to make a grating which maximizes intensity for a desired order and minimizes it for other selected neighboring orders. Technical details on various parts of the process are described. Author (TAB)

N70-29529# Massachusetts Inst. of Tech., Cambridge. Acoustics and Vibration Lab.

ACOUSTIC RADIATION FROM FLUID LOADED RECTANGULAR PLATES

Huw G. Davies Aug. 1969 93 p refs

(Contract N00014-67-A-0204-0030)

(AD-702195; TR-71476-1) Avail: CFSTI CSCL 20/1

The acoustic radiation into a fluid filled infinite half-space from a randomly excited, thin rectangular plate inserted in an infinite baffle is discussed. The analysis is based on the in vacuo modes of the plate. The modal coupling coefficients are evaluated approximately at both low and high (but below acoustic critical) frequencies. An approximate solution of the resulting infinite set of linear simultaneous equations for the plate modal velocity amplitudes is obtained in terms of modal admittances of the plate-fluid system. These admittances describe the important modal coupling due to both fluid inertia and radiation damping effects. The effective amount of coupling, and hence the effective radiation damping acting on a mode, depends on the relative magnitudes of the structural damping, i.e., on the widths of the modal resonance peaks, and the frequency spacing of the resonances. Expressions are obtained for the spectral density of the radiated acoustic power for the particular case of excitation by a turbulent boundary layer. Author (TAB)

N70-29661# California Univ., Berkeley. Lawrence Radiation Lab.
LOSSES IN PULSED SUPERCONDUCTING MAGNETS
William S. Gilbert, Robert B. Meuser, and Ferd Voelker Aug. 1969 23 p refs Presented at the 7th Intern. Conf. on High Energy Accelerators, Yerevan, Armenia, 27 Aug.–2 Sep. 1969 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-18885; Conf-690811-15) Avail: CFSTI

AC, or cyclic, energy losses were determined in a series of geometrically similar solenoids wound with single-core, untwisted-multicore, and twisted-multicore composite superconductor. The twisted-multicore has markedly reduced losses compared with the other alternatives. A larger solenoid was wound with twisted-multicore rectangular conductor. This same type conductor was also used in a dipole (bending) magnet geometry both with and without a cylindrical iron return yoke. Magnetization measurements on multicore composition as a function of mechanical twist rate and magnetic sweep are presented. Theoretical loss of a function of NbTi filament size and maximum swept field are presented. The agreement of the above measurements with theory is discussed. Author (NSA)

N70-29688# Polytechnic Inst. of Brooklyn, Farmingdale, N.Y. Dept. of Electrophysics.
MICROWAVE ACOUSTICS AND NONLINEAR OPTICS Final Report, 1 Dec. 1968–30 Sep. 1969
Arthur A. Oliner 26 Nov. 1969 29 p refs
(Contract F19628-69-C-0078)
(AD-700813; PIBEP-69-051; AFCRL-69-0526) Avail: CFSTI CSCL 20/1

The investigations were concerned with nonlinear interaction effects in solids, particularly those related to microwave acoustics and nonlinear optics. The studies themselves are basic in character, with emphasis on thorough treatments; the motivation for the topics chosen has in all cases been their importance and usefulness in various applications. Among the topics treated in detail are: methods of exciting Rayleigh surface acoustic waves on piezoelectric crystals, a coupled-mode interpretation of Bragg diffraction, the scattering of bounded laser beams by acoustically-modulated media, traveling-wave photoelastic parametric amplification, and magnetoelastic parametric interactions. Author (TAB)

N70-29731# Rochester Univ., N.Y. Dept. of Physics and Astronomy.
INVESTIGATIONS BY ANALYTIC AND THEORETICAL PROCEDURE OF VISIBILITY FUNCTIONS Final Report, 1 Dec. 1965–31 Dec. 1969
Emil Wolf Jan. 1970 28 p ref
(Contract AF 19(628)-4771)
(AD-702539; AFCRL-70-0104) Avail: CFSTI CSCL 20/6

The work was chiefly concerned with procedures of recovering spectral and other information from visibility functions and with a number of closely related questions of optical coherence theory. Author (TAB)

N70-30121*# Rochester Univ., N.Y. Inst. of Optics.
PROPERTIES OF MULTILAYER FILTERS Interim Report, 1 Sep. 1969–28 Feb. 1970
P. W. Baumeister 28 Feb. 1970 26 p refs
(Grant NGL-33-019-003)
(NASA-CR-110405) Avail: CFSTI CSCL 20F

The possible uses of films of gold and silver in optical interference coatings for the spectral region from 200 nm to 300 nm is discussed. The measured transmittance of solar blind bandpass filters with a pass-band at 250 nm is shown. Author

N70-30270# Sandia Corp., Albuquerque, N.Mex.
KINETICS OF A SPARK BY THE LIGHT OF AN OPTICAL QUANTUM GENERATOR (LASER) ON THE SURFACE OF DIELECTRICS [KINETIKA ISKRY, VOZBUZHDAEMOI SVETOM O.K.A. NA POVERKHNOSTI DIELEKTRIKOV]
A. P. Veduta et al 4 Dec. 1969 4 p ref Transl. into ENGLISH from Zh. Prikl. Spektrosk. (Belorussia), v. 6, 1967 p 256–257 Sponsored by AEC
(PB-188184T; SC-T-69-1057) Avail: CFSTI CSCL 20C

A light flash was detected on the dielectric surface under irradiation by the laser light. Its kinetics were studied and different mechanisms of its excitation are discussed. Author (USGRDR)

N70-30320# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE MAGNETIC FIELD IN SUPERCONDUCTING SHIELDED SYNCHRONOUS MACHINES
A. I. Bertinov et al 25 Nov. 1969 14 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Energ. Transp. (USSR), no. 2, 1969 p 96–101
(AD-700799; FTD-HT-23-430-69) Avail: CFSTI CSCL 9/3

The magnetic field of the superconducting winding of a shielded synchronous machine is investigated, expressions for components of magnetic field strength are obtained, and the shape factor of the field of a synchronous machine with ferromagnetic and superconducting shields is determined. Graphic dependences are given for the distribution of the components of magnetic field strength along the radius for various numbers of pairs of poles, and the relationship of geometrical dimensions of a superconducting winding and shield is shown. Author (TAB)

N70-30339# Tennessee Univ., Knoxville. Ultrasonics Lab.
PARAMETRIC GENERATION OF ULTRASONIC WAVES: LINEAR AND NONLINEAR PHENOMENA
Laszlo Adler Jan. 1970 75 p refs
(Contract Nonr-4289(01))
(AD-702487; TR-7) Avail: CFSTI CSCL 20/1

The problem of a fluid-filled cavity caused to resonate by an ultrasonic wave is described as a parametric phenomenon. Variations of the cavity dimensions produce instabilities in the liquid. As a result fractional harmonics of the drivers frequency are parametrically generated. The wave equation describing the system is transformed into an ordinary differential equation with varying coefficients. The solution of this differential equation (Mathieus equation) predicts a frequency spectrum which agrees with that observed experimentally. From the limit of the region of instability of the Mathieu function, a threshold of parametric excitation is obtained. This threshold criterion relates the amplitude and frequency of the driver transducer to the cavity length and to the absorption per wavelength of the medium. The nonlinearity of the medium, although it appears to be responsible for limiting the growth of the parametrically excited ultrasonic wave, does not affect the threshold. Reasonable agreement between theory and experiment is obtained. Examples of parametric phenomena observed in many branches of physics are discussed. Author (TAB)

N70-30364# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.

LARGE AMPLITUDE WAVES IN STRATIFIED MEDIA: ACOUSTIC-PULSES IN A STRATIFIED ATMOSPHERE

E. Varley and E. Cumberbatch (Purdue Univ.) Dec. 1969 60 p refs
(Contract DAAD05-69-C-0053)
(AD-702937; CAM-110-8; BRL-CR-6) Avail: CFSTI CSCL 20/1

A general theory is presented which describes disturbances generated by large amplitude, high frequency pulses in stratified media. The theory is used to discuss large amplitude, but shockless, acoustic-gravity pulses progagating under the influence of a constant gravity force into an atmosphere which need not be in thermal equilibrium before their arrival. The modulating influences of pressure and temperature stratification on the amplitudes of such pulses as they move towards or away from earth are described in detail. Author (TAB)

N70-30400*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A REVIEW ON FILM BOILING

Y. Y. Hsu 1970 45 p refs Presented at Cryogenic Eng. Conf., Boulder, Colo., 17-19 Jun. 1970
(NASA-TM-X-52837) Avail: CFSTI CSCL 20L

The major contributions and states of the art for film boiling are summarized. The topics covered are: (1) boiling of drops and puddles, (2) pool boiling for various geometries, and (3) forced convective film boiling inside channels and tubes. Author

N70-30408# Technische Hochschule Carolo Wilhelmina, Brunswick (West Germany). Inst. fuer Elektrische Maschinen, Antriebe und Ba Nen.

THE CALCULATION OF FIELD DISTRIBUTION AND MAGNETIC POTENTIAL IN HIGHLY SATURATED PARTS OF THE MAGNETIC CIRCUIT OF ELECTRIC MACHINES [ZUR BERECHNUNG DER FELDVERTEILUNG UND DER MAGNETISCHEN SPANNUNG IN HOCHGESAETTIGTEN TEILBEREICHEN DES MAGNETISCHEN KREISES ELEKTRISCHER MASCHINEN]

Reinhart Baehr (Ph.D. Thesis) 1967 126 p refs In GERMAN
Avail: CFSTI

The calculation of magnetic fields in iron is very difficult, due to the nonlinear magnetization curve. The field distributions in the highly saturated parts of the magnetic circuits of electric machines were calculated with the aid of analytic and numerical computation methods, in order to obtain data on the magnetic potential. Author (ESRO)

N70-30554# Fraunhofer-Gesellschaft zur Forderung der Angewandten Forschung E. V., Karlsruhe (West Germany). Inst. fuer Angewandte Mikroskopie, Photographie und Kinematographie.

THE IMPORTANCE OF OPTICAL- AND ELECTRON-MICROSCOPY FOR APPLIED RESEARCH [DIE BEDEUTUNG DER LICHT- UND ELEKTRONEN-MIKROSKOPIE IN DER ANGEWANDTEN FORSCHUNG]

H. Reumuth *In its* Examples of Appl. Res. Jun. 1967 p 21-27 In GERMAN (See N70-30551 15-34)
Avail: CFSTI

Possible applications of microscopy to applied research in all scientific and technological fields are surveyed. ESRO

N70-30573# Technische Hochschule Aachen (West Germany). Lab. fuer Ultraschall.

ON THE TECHNICAL POSSIBILITIES OF ULTRASOUND DISPERSION OF SOLUTIONS AND MELTS [UEBER DIE TECHNISCHEN MOEGLICHKEITEN EINER ULTRASCHALLVERNEBELUNG VON LOESUNGEN UND SCHMELZEN]

R. Pohlman *In* Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 136-146 In GERMAN (See N70-30551 15-34)
Avail: CFSTI

Possible applications of ultrasonics to aerosol therapy (fog dispersion), air conditioning, vaporizing of solutions, atomizing of fuels for engines and metal melting are discussed. ESRO

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular, and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N70-29226# Brookhaven National Lab., Upton, N.Y.

GAMMA-RAY SPECTRA FOLLOWING CAPTURE OF EPITHERMAL NEUTRONS

R. E. Chrien 1 Dec. 1969 33 p refs
(BNL-14200) Avail: CFSTI

The usefulness of gamma-ray spectroscopy in the study of epithermal neutron capture is examined. Progress in understanding nuclear structure, the capture reaction mechanism, and related topics in applied nuclear physics through the use of resonance gamma-ray spectroscopy is discussed and some examples are presented. NSA

N70-29232# Michigan State Univ., East Lansing. Dept. of Chemistry.

ELECTRON SPIN RESONANCE STUDIES OF RADIATION EFFECTS Technical Report, 1 Jan. - 31 Dec. 1969

Max T. Rogers 31 Dec. 1969 7 p refs
(Contract AT(11-1)-1385)
(COO-1385-30) Avail: CFSTI

The trimethylacetamide radical was observed in the ESR spectrum of trimethylacetamide gamma-irradiated at 77 K. ESR spectral studies on monocrystalline sec-butyramide, gamma-irradiated at 77 K, indicated the existence of the dimethylacetamide radical. Radicals formed in the irradiation at 77 K of the ammonium salts of monofluoroacetic acid and difluoroacetic acid are being evaluated. NSA

N70-29242 Michigan State Univ., East Lansing.

INELASTIC PROTON SCATTERING AT 40 MeV FROM THE EVEN NICKEL ISOTOPES

Kenneth Marvin Thompson (Ph.D. Thesis) 1969 301 p
Avail: Univ. Microfilms: HC $13.75/Microfilm $3.90 Order No. 69-20944

Angular distributions from about 15 deg to 90 deg were obtained for each nucleus in 5 deg steps using Ge(Li) charged particle detectors. The best energy resolution achieved was 45 keV. All of the resulting angular distributions are presented in both a tabular and a graphical form. A high precision goniometer was designed and constructed to facilitate the use of Ge(Li) detectors. The experimental angular distributions for all of the observed states were compared with calculated distributions using a collective model distorted wave theory. From these comparisons values for the nuclear deformation parameters were obtained. The resulting nuclear deformations were used to calculate the vibrational model parameters and the reduced transition probabilities. The fractional depletion of an energy weighted sum rule and a sum rule based on the shell-model were also calculated for each state. The dependence of the reduced transition probabilities and sum rule limits on the model used for the nuclear charge density was also examined. Dissert. Abstr.

N70-29268# California Univ., Berkeley. Lawrence Radiation Lab.

MULTIPERIPHERAL DYNAMICS

Geoffrey F. Chew Dec. 1969 23 p refs Presented at Regge-Pole Conf., Irvine, Calif., 5-6 Dec. 1969
(Contract W-7405-eng-48)
(UCRL-19437; CONF-691202-2) Avail: CFSTI

The relation of multiperipheralism with Regge poles is discussed. Included in this discussion are the multi-Regge-pole model, generation of Regge poles and cuts, and several other models and some previous results. NSA

N70-29283# Joint Publications Research Service, Washington, D.C.

THE SEARCH FOR QUARKS

Ye. L. Feynberg *In its* Soviet Studies of Universe Jan. 1970 p 17-29 refs (See N70-29281 15-30)
Avail: CFSTI

The hypothesis for the existence of quarks is discussed in terms of whether they are real particles or simply a nature of motion of crystal atoms. Three principal directions are considered in the search for quarks, including generation by cosmic rays, generation in particle accelerators, and stopping of slow quarks by the earth's crust, sea water, and air. One experiment is considered in which quarks are believed to have been observed in cosmic ray showers. R.B.

N70-29285# General Electric Co., Schenectady, N.Y. Knolls Atomic Power Lab.

INCLUSION OF TWO-DIMENSIONAL SPECTRAL EFFECTS IN FEW-GROUP CELL CALCULATIONS

B. W. Crawford, J. P. Friedman, and F. C. Merriman [1969] 30 p refs Presented at the Am. Nucl. Soc. Winter Meeting, San Francisco, Calif., 30 Nov. - 4 Dec. 1969
(Contract W-31-109-eng-52)
(KAPL-P-3869; CONF-691102-21) Avail: CFSTI

The use of two-dimensional diffusion theory spectra to obtain few-group neutron cross sections for transport-theory eigenvalue calculations is discussed. The calculations, using the IT program, describe the spatially dependent reaction rates within a 1/5-absorber plate surrounded by fuel and water. Results of both the cross section calculation and flux synthesis are tabulated. The trial spectra used to establish the spatially dependent spectra are shown graphically. Eigenvalues computed by variational synthesis techniques and Monte Carlo techniques are compared. NSA

N70-29309# Colorado Univ., Boulder. Dept. of Physics and Astrophysics.

[ON NUCLEAR PHYSICS] Technical Progress Report, 1 Nov. 1968 - 1 Nov. 1969

1 Nov. 1969 124 p refs
(Contract AT(11-1)-535)
(COO-535-603) Avail: CFSTI

Progress is reported on angular distributions for helium 3 reactions in A1-17, F-19, In-113, K-39, Si-28, Ti-46, Y-89, and Zr-90; neutron angular distributions for alpha and proton reactions in C-12, Cu-63, Ni-60, Ni-62, Si-28, Ta-181, and Zr-90; development of high resolution charged particle time-of-flight spectrometers; design of pulsed ion source for FFAG cyclotrons; development of germanium crystal diffraction X-ray spectrometers; helium 3 and proton elastic scattering in Bi-209, deuterium, Hg-198, Pb-208, and Si-28; internal conversion coefficients for energy level transitions from Ta-181(p,2n) reactions in W-180; and development of quadrupole magnetic analyzers for nuclear reaction studies. NSA

N70-29342 Johns Hopkins Univ., Baltimore, Md.

GROUP THEORY, MIXED ATOMIC CONFIGURATIONS, AND THE CALCULATION OF RELATIVISTIC EFFECTS

John Caldwell Morrison (Ph.D. Thesis) 1969 97 p
Avail: Univ. Microfilms: HC $5.00/Microfilm $3.00 Order No. 69-21072

A group-theoretical scheme is introduced to classify the states of an atomic system having two open shells. States labeled according to this scheme are written in such a way that they serve as a convenient basis for the calculation of matrix elements. The matrix elements of operators between the states of two configurations are obtained from these matrix elements by means of a unitary transformation. As an example matrix elements of a coulomb interaction are calculated. The coulomb interaction, a spin-orbit interaction, and a Breit interaction are represented by equivalent operators within a j-j coupling scheme. Dissert. Abstr.

N70-29366 Pennsylvania State Univ., University Park.

A FOUR PARAMETER EXTENSION OF THE THEOREM OF CORRESPONDING STATES

Eugene Albert Harlacher (Ph.D. Thesis) 1968 143 p
Avail: Univ. Microfilms: $6.80/Microfilm $3.00 Order No. 69-5553

The objectives of this program were to develop tractable characteristic correlating parameters to be used in an extended theorem of corresponding states, which would be applicable for predicting physical and thermodynamic properties of large, small, nonpolar, polar, hydrogen-bonding and quantum substances, and to develop correlations for these properties under the unified approach of the theorem of corresponding states. The fourth parameter used in this work is the parachor. This parameter is used to characterize molecular size-shape, whereas the acentric factor is a measure of molecular size-shape, polarity, quantum influence, and hydrogen bonding. These two parameters were empirically combined in a polynomial expansion to separate molecular size-shape effects from the association effects. The effectiveness of this separation was demonstrated by developing analytical correlations for vapor pressures, critical compressibility factors, saturated liquid densities, and saturated vapor densities for pure substances. Dissert. Abstr.

N70-29379# Naval Postgraduate School, Monterey, Calif.

LARGE ANGLE SCATTERING OF H(+) AND H2(+) BY ARGON

Everrette Verne Snotherly, Jr. (M.S. Thesis) Oct. 1969 73 p refs
(AD-701667) Avail: CFSTI CSCL 7/4

The elastic differential scattering cross sections for H(+), H2(+) + Ar to H(+), H2(+) + Ar were measured for angles of 39 to 50 deg with incident lab energy of 100 eV. The apparatus utilized the properties of axially symmetric, non-uniform magnetic fields (large thin solenoid) to focus all scattered ions with vector momentum p within Delta p onto a detector placed down the magnetic axis. Thus, the solid angle was increased by a factor of about 300 over conventional methods with comparable resolution. Author (TAB)

N70-29380# Rensselaer Polytechnic Inst., Troy, N.Y.

THICK-SAMPLE NEUTRON TRANSMISSION MEASUREMENTS OF THE 229-eV RESONANCE IN Cu 65

N. Yamamuro and R. C. Block [1969] 6 p refs
(Contract AT(30-1)-328)
(RPI-328-179) Avail: CFSTI

Thick-sample neutron transmission measurements were carried out upon copper to determine the orbital angular momentum of the 229-eV resonance in Cu-65. Characteristic s-wave resonance-potential interference was observed in the transmission data, and together with reported capture spectra results, leads to a J sup pi of 2(-) for this resonance. A neutron width of (15 + or - 1.5) MeV is obtained from this measurement. Author (NSA)

N70-29396# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

SYMMETRY PROPERTIES AND THE BOLTZMANN

DISTRIBUTION

A. Ya. Ender 23 Oct. 1969 28 p refs Transl. into ENGLISH from Vestn. Leningr. Univ., Ser. Mat., Mekh. i Astron. (Leningrad), v. 21, no. 19, no. 4, 1966 p 116 – 128
(Contract NOw-62-0604-c)
(AD-700357; APL-CLB-3-T-612) Avail: CFSTI CSCL 20/13

The necessary conditions for the equilibrium of the Maxwell-Boltzmann distribution are found. Using the analyticity of the S-matrix, the conditions necessary for equilibrium are found. They are different from Stueckelbergs conditions, occupying an intermediate position between detailed balance and Stueckelbergers conditions. They are a consequence of the reversibility of the equations of motion of microparticles with time. TAB

N70-29444# Washington Univ., St. Louis, Mo.

PRODUCTS FROM THERMAL-NEUTRON INDUCED FISSION OF U 235: A CORRELATION OF RADIO-CHEMICAL CHARGE AND MASS DISTRIBUTION DATA

A. C. Wahl, A. E. Norris, R. A. Rouse, and J. C. Williams [1969] 35 p refs
(Contract AT(11-1)-1162)
(COO-1162-35; SM-122/116) Avail: CFSTI

Mass and charge distribution data for fission products after prompt neutron emission were compiled and used to determine nu sub t, the average number of prompt neutrons emitted in forming products with complementary mass numbers, and also Z sub P and sigma, parameters in a new charge-distribution formulation. The compilation includes both new data and older data, some of it re-evaluated using current values for fission-product half-lives and delayed-neutron yields. The values of nu sub t are generally consistent with results derived from direct physical measurements. The zeta sub p values, the most probable (or average) charge for isobars, derived from radiochemical data are also consistent with those determined by physical methods involving measurement of x-ray or beta-decay chain lengths. Author (NSA)

N70-29500# California Inst. of Tech., Pasadena. Dept. of Physics.

NON SHRINKING DIFFRACTION PEAKS

F. Zachariasen [1969] 17 p Presented at Conf. on Fundamental Interactions at High Energy, Coral Gables, Fla., 21 – 23 Jan. 1970
(Contract AT(11-1)-68)
(CALT-68-242; CONF-700107-1) Avail: CFSTI

The possibility is discussed that forward peaks in high energy elastic scattering do not shrink with energy. It is assumed that in the limit s approaches limit of infinity, t is fixed, and an elastic differential cross section has the form d sigma/dt approaches limit of (f(t)) sq/16 pi independent of s. It is also assumed that total cross sections approach constants asymptotically. Analyticity, crossing, and unitarity are discussed. NSA

N70-29542# Brookhaven National Lab., Upton, N.Y.

THEORIES OF STRONG INTERACTIONS AT HIGH ENERGIES

Ronald F. Peierls, ed. Feb. 1970 481 p refs Summer School in Elementary Particle Phys. held at Upton, N.Y., 22 Jul. – 29 Aug. 1969 Sponsored by AEC
(BNL-50212) Avail: CFSTI

Seven lectures are documented: (1) experimental research in high energy interactions, (2) review of multiperipheral dynamics, (3) formalism and phenomenology of complex angular momentum, (4) rigorous properties of scattering amplitudes at high energies, (5) dynamical models based on classical limits, (6) dynamical models based on unitarity and analyticity, and (7) duality and hadron dynamics technology. E.C.

N70-29657# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Experimentelle Kernphysik.

DOUBLE SCATTERING OF 51 MeV DEUTERONS ON CARBON

E. Seibt, Ch. Weddigen, and K. Weigele Aug. 1968 14 p refs
(PB-187879; KFK-1006) Avail: CFSTI CSCL 20H

Double scattering of 51 MeV deuterons on carbon shows strong vector polarization effects. Tensor polarization effects are found to be small. Optical model predictions by Satchler are discussed. USGRDR

N70-29676# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Physics.

A POSSIBLE DIFFICULTY WITH THE EIKONAL PICTURE OF HIGH ENERGY INTERACTIONS

P. B. Cantor [1969] 8 p refs
(Contract AT(11-1)-1573)
(COO-1573-66) Avail: CFSTI

An heuristic argument is presented suggesting that at high energies the effect of multiple scattering off the energy shell becomes important for an understanding of the propagation of one elementary particle through another. Author (NSA)

N70-29684# Brookhaven National Lab., Upton, N.Y. Accelerator Dept.

BETATRON FREQUENCY JUMP AT TRANSITION IN THE BROOKHAVEN AGS

E. C. Raka 5 Jan. 1970 18 p refs Sponsored by AEC
(BNL-14417) Avail: CFSTI

Recent investigations on the CERN PS have shown that by rapidly jumping the horizontal nu value when the transition energy is reached, the high intensity space charge effects can be markedly reduced or eliminated. It is estimated that these effects will be approximately equal to 1/8 as large in the AGS for a given beam intensity than in the XWEN PS. Some success at suppressing the bunch shape oscillation generated just after transition by the longitudinal space charge forces was achieved in the AGS using a feedback damping system. Also an empirically arrived at adjustment of transition parameters which in reality produces a fairly rapid nu change has been used for some time to aid in reducing the bunch shape oscillations and to minimize any rapid debunching that may occur just after transition. This method and its possible future application is described and also the available quadrupoles in the AGS which could be used for a nu jump at transition are discussed. Author (NSA)

N70-29685# Bettis Atomic Power Lab., Pittsburgh, Pa.

AN EVALUATION OF THE NEUTRON REACTION CROSS SECTIONS AND FISSION SPECTRUM OF U 233 FOR ENDF/B (LWBR DEVELOPMENT PROGRAM)

N. M. Steen Dec. 1969 160 p refs
(Contract AT(11-1)-GEN-14)
(WAPD-TM-691) Avail: CFSTI

A review of the nuclear data of U-233 was conducted. Primary emphasis was placed on the neutron capture and fission cross sections, neutron yield per fission, and the fission neutron emission spectrum. The result of this review is an ENDF/B type compilation of nuclear data which are given in the Appendix. This compilation appears to correct the previous disagreement in epithermal alpha of U-233 and observed biases in calculated reactivity. These data have been subjected to several tests of validity for application in reactor design. Some of these tests are discussed in the body of the text. Author (NSA)

N70-29686# Brookhaven National Lab., Upton, N.Y. Accelerator Dept.

STATIONARY CYLINDRICAL BEAM UNDER SPACE-CHARGE CONDITIONS

J. Claus and A. Benton 2 Jan. 1970 16 p Sponsored by AEC

(BNL-14447) Avail: CFSTI

Self-consistent charge distributions and two-dimensional emittances for a beam with cylindrical symmetry and a uniform density in four-dimensional phase space moving in a smoothly approximated focusing system are obtained by direct integration.
Author (NSA)

N70-29717# Oak Ridge National Lab., Tenn.
ISOTOPE PROGRAM (5000) Progress Report, Period Ending 31 Dec. 1969
J. H. Gillette Mar. 1970 16 p refs
(Contract W-7405-eng-26)
(ORNL-TM-2889) Avail: CFSTI

Progress is summarized on target fabrication and development, isotopic separations, radioisotopic separations, sector isotope separator operation, chemistry of processing, and isotope sales.
NSA

N70-29724*# Scientific Translation Service, Santa Barbara, Calif.
CONTRIBUTION TO THE THEORY OF AVALANCHE AND STREAMER CHAMBERS [CONTRIBUTION A LA THEORIE DES CHAMBRES A AVALANCHES ET A STREAMERS]
F. Schmitt et al Washington NASA Jun. 1970 29 p refs
Transl. into ENGLISH from Nucl. Instr. and Methods, v. 76, 1969 p 258–272
(Contract NASw-2035)
(NASA-TT-F-13090) Avail: CFSTI CSCL 20H

The Raether mechanism of the spark formation is applied to a streamer chamber and discussed. This leads to a more accurate calculation of the critical number of electrons and of the avalanche and streamer dimensions. Effect of pulse rise-time, delay, and shape is analysed and leads to conclusions on the track appearance. Experimental evidence of most of the calculations is given.
Author

N70-29738# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.
THE MEASUREMENT OF THE PRINCIPAL NEUTRON INDUCED RADIOACTIVITIES IN REACTOR GRADE TITANIUM METAL BY HIGH RESOLUTION Ge(Li) GAMMA-RAY SPECTROMETRY
D. Reed and J. R. Harvey Oct. 1969 15 p refs
(RD/B/N-1323) Avail: AEC Depository Libraries

Component isotopes having both long and short half-lives arising from the Ti matrix by (n,gamma) and (n,p) reactions, and from trace impurities by (n,gamma) reactions, were measured after suitable decay periods. A mathematical expression is derived for the relative sensitivity of 1/cucm planar detector to disc and cylindrical sources. This was used for the conversion of sample counting rates to disintegration rates.
Author (NSA)

N70-29761*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPUTER-MADE MOTION PICTURES AND TIME HISTORY PLOTS OF ION-POLAR MOLECULE COLLISIONS
John Y. Dugan, Jr., R. Bruce Canright, Jr., and Raymond W. Palmer Washington Jun. 1970 34 p refs
(NASA-TN-D-5747; E-5250) Avail: CFSTI CSCL 20H

Motion pictures and time history plots of ion-dipole collisions involving the polar molecules CO, HCl, and CH3CN were made using a computer plotter. The three polar molecules studied cover a range of dipole moments and moments of inertia of interest in ion-molecule collisions. The result of numerical integration are stored on magnetic tape and processed by the IBM 360/67 using calls to subroutines of the CDC DD280 plotter system. These plot results on 35-millimeter film are made into black-on-white prints, whereas the motion pictures are converted to 16-millimeter white-on-black. The collision motion pictures provide instantaneous correlation of translational (ion) and rotational (dipole) motion during interaction. The motion picture results and time history plots complement each other in providing qualitative and quantitative results of collision behavior. All three polar rotators are hindered by the incident ion; the nature and chemical aspects of this hindered rotation are discussed.
Author

N70-29779# European Organization for Nuclear Research, Geneva (Switzerland).
HAMILTONIAN MECHANICS WITH A SPACE COORDINATE AS INDEPENDENT VARIABLE, PART 1. CANONICAL THIN LENS APPROXIMATION FOR AN ACCELERATING GAP, PART 2
B. Schnizer 13 Mar. 1970 54 p refs
(CERN-70-7) Copyright. Avail: Issuing Activity

For application in linear accelerators a kind of Hamiltonian mechanics is developed where the logitudinal space coordinate, z, is the independent variable in place of time, t. This is done by changing in Hamilton's principle the variable of integration from t to z and by employing afterwards the usual Legendre transformation. The corresponding Lagrangian, Hamiltonian, canonically conjugate variables and canonical transformations are discussed. In the so-called thin lens approximation, the real trajectory of a single proton crossing a gap of a linac Alvarez structure is replaced by a fictitious one consisting of step functions as if the gap were reduced to its median plane. A thin lens Hamiltonian is derived from which these increments can be derived by partial derivations. By canonical transformations a complete set of reduced variables is introduced. Reduced variables are constant in the absence of fields acting on the particle. The transformed Hamiltonian is solved by iterations starting from free particle motion. To first order it depends only on the constant mid-gap values of the reduced variables and on the independent variable, the longitudinal space coordinate. Integrating with respect to it across the gap gives the thin lens Hamiltonian. The modified Panofsky equations are derived for the change of kinetic energy and phase across a linac gap in the one-dimensional problem.
Author

N70-29800# Comitato Nazionale Energia Nucleare, Bologna (Italy).
TRANSPORT COEFFICIENTS OF THERMAL NEUTRONS IN A PROTON FREE GAS
V. G. Molinari and P. Rossi (Bologna Univ.) [1969] 20 p refs
(RT/FI(70)3) Avail: CFSTI

The transport coefficients of thermal neutrons, that enter the expressions of the current density and the energy flow when a gradient of neutron density and of temperature occurs, are calculated. The framework of the proton free gas model when the isotropic part of the neutron velocity distribution is supposed to be a Maxwellian at some temperature, function of x, and different from the moderator temperature, these coefficients satisfy the Onsager relations.
Author

N70-29870# Kyoto Univ. (Japan). Research Inst. for Fundamental Physics.
FERMION REGGE TRAJECTORY
Yoichi Iwasaki Mar. 1970 17 p refs
(RIFP-99) Avail: CFSTI

It is shown that there is no relation between the McDowell symmetry and the existence of parity doublets, and that there are examples satisfying the MacDowell symmetry in which the Regge parameter is not regular at the point W = 0. The asymptotic behavior in the ladder model calculated and the explicit form of the Regge trajectory is obtained.
Author

N70-29872# Comitato Nazionale per l'Energia Nucleare, Bologna (Italy). Centro di Calcolo.
ENDOMOPHISM OF A LEBESGUE SPACE AND Lp (p73) IN

A THREE-DIMENSIONAL PROBLEM OF NEUTRON TRANSPORT THEORY

V. C. Boffi and V. G. Molinari 11 Dec. 1969 47 p refs
(RT/FI(70)6) Avail: CFSTI

An endomorphism of a Lebesgue space Lp (delta sub 3) with 3<P<infinity, where delta sub 3 is an infinite three-dimensional domain, is discussed in some detail. Such an endomorphism occurs in the study of a linear integral nonsingular equation. This equation governs the three dimensional Fourier transform of the total flux of monoenergetic neutrons, which diffuse from an isotropic pointwise source located at the centre of a parallelepiped of moderator material. Author

N70-29873# Comitato Nazionale per l'Energia Nucleare, Bologna (Italy). Centro di Calcolo.

BIOSTAW: A FORTRAN PROGRAM FOR THE CALCULATION OF THE NUCLEON BOUND STATES IN A WOODS-SAXON WELL

F. Fabbri and A. M. Saruis 25 Jul. 1969 18 p refs
(RT/FI(69)30) Avail: CFSTI

A description is given of the BOSTAW program, written in FORTRAN 4 for a IBM 7094 computer. The program computes the nucleon bound eigenfunctions and eigenvalues in a Woods-Saxon well. Author

N70-29874# Comitato Nazionale per l'Energia Nucleare, Rome (Italy). Lab. Fisica e Calcolo Reattori.

THE CIAP-O PROGRAM

G. P. Cecchini and M. Cosimi 25 Sep. 1969 21 p ref
(RT/FI(69)42) Avail: CFSTI

The CIAP-O program calculates real and adjoint fluxes for a given composition on the basis of the multigroup zero dimensional diffusion theory, as well as real and adjoint generalized importances related to a linear or bilinear functional of the real or adjoint fluxes. By means of these fluxes and importances, the program can calculate any variation of the functional considered in the generalized perturbation theory approximation. Author

N70-29875# Joint Inst. for Lab. Astrophysics, Boulder, Colo. Information Center.

COMPILATION OF LOW ENERGY ELECTRON COLLISION CROSS SECTION DATA. PART 1: IONIZATION, DISSOCIATIVE PROCESSES, AND VIBRATIONAL AND ROTATIONAL EXCITATION

L. J. Keiffer 10 Jan. 1969 103 p refs
(PB-189127; JILA-IC-6) Avail: CFSTI CSCL 07D

The compilation is limited to experimental measurements and includes data for all atomic species and for those molecules which are important in aeronomy, astrophysics, and plasma physics. The literature was searched for data through September of 1968. Ionization CH, He, Li, C, N, O, Ne, Na, Mg, Ar, K, Ca, Cu, Zn, Kr, Rb, Sr, Ag, Xe, Cs, Ba, Hg, Tl, Pb, H2, D2, N2 CO, NO, O2, Hcl, H2O, CO2, N2O, C2H2, CH4, CD4, C2H4, SF6, C2H6): Dissociative processes (H2, HD, D2, N2, CO, NO, O2, HCl, HBr, 12, H2O, CO2, N2O, C2H2, CH4, CD4, SF6); Vibrational excitation (H2, N2, CO). USGRDR

N70-29877*# Miami Univ., Coral Gables, Fla. Center for Theoretical Studies.

THEORY OF RELATIVISTIC SUPERMULTIPLETS. PART 2: PERIODICITIES IN HADRON SPECTROSCOPY

Behram Kursunoglu Dec. 1969 78 p refs
(Grants NGL-10-007-010; AF-AFOSR-1268-67)
(NASA-CR-110359; CTS-HE-69-5) Avail: CFSTI CSCL 20H

The theory for all fundamental particles proposed earlier is further discussed and the higher hadron supermultiplets and the corresponding mass levels of the various spins and parities are calculated. The results of the theory and the experimental data on hadron masses are found to be in excellent accord. The parities of the particles are obtained unambiguously and the theory predicts 2(−) and higher spin mesons in addition to known ones. Higher spin massive and massless leptons are also predicted. The most fundamental feature of the wave equation is the prediction of a periodicity in the hadron and lepton spectra. No two baryons or two mesons can occupy the same state and therefore their wave functions must be antisymmetric with respect to an interchange of their respective quantum numbers. A further consequence is the prediction of integral spin leptons. Author

N70-29897# Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia).

COLD NEUTRON SOURCE EFFICIENCY IN A TANGENTIAL BEAM HOLE

V. Dimic and J. Petkovsek Nov. 1969 12 p refs Submitted for publication
(IJS-R-571) Avail: CFSTI

Cold neutron beam intensity was measured for differently shaped moderator chambers at different positions in a 15 cm diameter tangential beam hole of the reactor Triga Mark 2. The measurements were performed at ambient temperatures. It was found that the most favorable configuration for moderator is a black body scatterer with a gain factor of 19 relative to the empty beam hole and 1.7 relative to 15 cm long graphite slab. The cold neutron source inserted into the tangential beam hole is described. Measurements of the gain factor for a graphite slab, methyl alcohol, and methane are discussed. Author

N70-29898# Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia).

TABLES OF TOTAL ABSORPTION CROSS SECTIONS FOR PHOTONS OF ENERGY BETWEEN 10 AND 30 MeV IN Be, C, N2H4, H2O, HF, Si and Ca

N. Bezic, D. Brajnik, D. Jamnik, G. Kernel, and U. Miklavzic Nov. 1969 25 p refs
(IJS-R-572) Avail: CFSTI

The attenuation coefficients were determined with an experimental apparatus consisting of a 33 MeV Betatron as a gamma-ray source, the absorber, and a four-channel Compton spectrometer. The resolution of the spectrometers was about 2% and the experimental values within energy intervals of less than 100 keV were normally joined into one value. The errors given in the tables are either statistical or rms values, whichever are the largest. Author

N70-29916# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).

DIP STRUCTURE MECHANISM AND RATIO OF NEUTRAL X PION PHOTOPRODUCTION ON PROTON AND NEUTRON

J. Tran Thanh Van Apr. 1970 12 p refs
(LPTHE-70/16) Avail: CFSTI

A dip structure mechanism based on nonsense wrong signature points and smallness of absorptive corrections is given. It explains the presence or absence of dips in all available experimental data especially the presence of a dip in the ratio of neutral pion photoproduction on proton and neutron. Author

N70-29919# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Nuclear Science.

CONTINUOUS SLOWING DOWN THEORY EXTENDED TO INELASTIC REGION

Martin Becker and Edward T. Burns 10 Mar. 1970 13 p refs
(Contract AT(30-1)-328)
(RPI-328-184) Avail: CFSTI

The continuous slowing down theory equations for inelastic scattering is developed for fast reactor analysis. A separable kernel is assumed for the overall slowing down problem and constraints on the kernel are defined. Results of calculations with the continuous slowing down model are compared with M(C sq) calculations. Effects of energy-dependent neutron-cross-section variations on the slowing down parameters are evaluated. NSA

N70-29924# Kyoto Univ. (Japan). Research Inst. for Fundamental Physics.

NUCLEI IN NEUTRON MATTER

H. A. Bethe (Cornell Univ., Ithaca, N. Y.) G. Boerner (Max-Planck-Inst. fuer Phys. und Astrophs.) and Katsuhiko Sato Mar. 1970 39 p refs

The equation of state at densities somewhat below nuclear density is reexamined. The results are in qualitative agreement with previous authors, but there are quantitative differences. Up to a density of 2.8 × 10 to the 11th power g/cu cm there are neutron-rich nuclei and electrons; between that density and a second density of 4.34 × 10 to the 13th power g/cu cm there is in addition a gas of free neutrons. At the second density, nuclei disappear rather suddenly, and are replaced by protons. As long as nuclei exist, their mass and charge increase monotonically with density; both Z and A are definite functions of density. Author

N70-29933# Chicago Univ., Ill. Enrico Fermi Inst.

FACTORIZATION OF SATELLITE TERMS IN THE N-PARTICLE DUAL AMPLITUDE

P. H. Frampton Feb. 1970 10 p refs Sponsored by AEC
(COO-264-536; EFI-70-8) Avail: CFSTI

Complete factorization of the N-particle dual amplitude with satellite terms is exhibited explicitly in a formalism using harmonic-oscillator-like creation and destruction operators. Author (NSA)

N70-29958# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).

SPECTRAL FUNCTION OF AN UNSTABLE PARTICLE IN THE LEE MODEL

D. Hittner Apr. 1970 43 p refs
(LPTHE-70/14) Avail: CFSTI

A proposal to define unstable particles by peaks in the spectral function associated to a field is tested on the example of the multiple Lee model. The interpretation of the spectral function is confirmed, but new definitions of the mass and width of an unstable particle are proposed. Author

N70-29964# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.

VALUE AND LIMITATIONS OF QUASI-FREE ELECTRON SCATTERING EXPERIMENTS ON ATOMS

U. Amaldi, Jr. and C. Ciofi Degliatti 1 Jul. 1969 20 p refs
(ISS-69/27) Avail: CFSTI

The possibility of checking different approaches to calculation of atomic structure using the (e,2e) experiments is investigated. The limitations on the atomic states which can be studied are considered. The origin of the limitations is not an experiment, but is part of the reaction being studied. Author

N70-30014# Aerospace Research Labs., Wright-Patterson AFB, Ohio.

REDUCTION OF INTERNAL CONVERSION ELECTRON DATA Final Report, Feb. 1967 -Jul. 1969

H. J. Hennecke Dec. 1969 40 p refs
(AD-702096; ARL-69-0212) Avail: CFSTI CSCL 20/8

A description is given of several methods of analyzing internal conversion electron spectra measured with a magnetic spectrometer. All the methods discussed used linear least-squares techniques or a suitable linearization for non-linear cases. The primary purpose of all these analysis techniques is to provide systematic methods for the most reliable determination of the intensity of conversion lines from available data and also a reliable estimate of the error limits for this intensity. Consideration is given to the problems associated with time correction of the single-channel-analyzer-type data obtained with magnetic spectrometers and to the combination of multiple scans over a given spectral region for such data. In particular, such corrections become quite complex in the study of internal conversion lines superimposed upon beta continua from a source containing several beta-decaying nuclides with different half-lives. In addition, spectrum stripping techniques utilizing empirical line shapes for a maximum of 5 overlapping lines are presented. The effects of correlations between the overlapping lines, the effects of the position (momentum) uncertainty of the lines, and the effects of empirical line shapes are discussed. Analysis techniques equivalent to those presented are invaluable for the routine analysis of conversion spectra, for the accurate determination of multipolarity mixing ratios and for the accurate measurement of L and M subshell ratios. Author (TAB)

N70-30068# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy).

VECTOR DOMINANCE MODEL AND INFINITE MULTIPLETS

S. Ferrara and A. F. Grillo 4 Mar. 1970 9 p refs
(LNF-7017) Avail: CFSTI

Models for the electromagnetic form factors of hadrons are essentially derived from the strong amplitude proposed by Veneziano. A possible interpretation of these so-called Feneziano-like form factors in the framework of the field theory of composite systems is presented. A phenomenological propagator is used which contains an infinite sequence of poles and vertex functions are computed as matrix elements of a vector operator between numbers of an infinite multiplet of some noncompact graph. The natural generalization of the Kroll-Lee-Zumino normalization condition, by means of an extension of the vector dominance hypothesis, is obtained. The asymptotic behavior of the pi and N form factors predicted are exactly reproduced if the external particles are assigned to the O(4.2) classification. The meson field coupled to the photon is treated as a superposition of conventional vector fields. Author

N70-30069# Los Alamos Scientific Lab., N.Mex.

NUCLEAR SAFEGUARDS RESEARCH AND DEVELOPMENT Program Status Reports, Jan. 1967 Jun. 1969

19 Dec. 1969 186 p refs
(Contract W-7405-eng-36)
(LA-4320-MS) Avail: CFSTI

Progress is reported under the following headings: pulsed neutron research, pulsed Cockcroft Walton Accelerator and auxiliary equipment, absolute delayed neutron yield measurements, dense plasma focus source, mathematical simulation studies of kinetic response measurements, detector development, delayed neutron kinetic response techniques for nondestructive assay of fissionable materials, abundances and periods of delayed neutrons from 14-MeV neutron fission, passive neutron counting techniques, self-indication techniques for DIA applications, transport theory calculations and analysis techniques, auxiliary assay techniques using fission delayed gamma rays, neutron multiplication effects in active interrogation methods, delayed gamma rays from fission, N-6 accelerators and neutron sources, parallel computational program, and a mobile safeguards assay laboratory. NSA

N70-30078# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Lab. Nazionali di Frascati.

A POSSIBLE TEST OF C CONSERVATION IN THE DECAY OF POSITRONIUM

R. Del Fabbro, G. Matone, and L. Satta 23 Mar. 1970 6 p refs *Its* Nota Interna No. 469

(LNF-70/11) Avail: CFSTI

The interference effect between the decay amplitude of long-lived kaons into 2 pion is investigated to determine the C-violating decay of parapositronium into 3 gamma. The positronium system is a bound state of an electron and a positron which in the ground state is in S = 0 or in S = 1. The described method permits lowering the present experimental limit on C violation in parapositronium decay by a factor of at least four. Author

N70-30083 European Organization for Nuclear Research, Geneva (Switzerland).

MODERN PHYSICS FROM AN ELEMENTARY POINT OF VIEW

V. F. Weisskopf 17 Mar. 1970 30 p refs

(CERN-70-8) Copyright. Issuing Activity

Modern physics is discussed in terms of elementary particles without regard to complicated theory and mathematics. Qualitative concepts are presented for atomic and molecular physics, nuclear forces, and the evolution of stars. R.B.

N70-30084# Comitato Nazionale per l'Energia Nucleare, Rome (Italy). Lab. Fisica Nucleare Applicata.

CALCULATED PHOTOEFFICIENCIES AND ENERGY LOSS SPECTRA FOR 3 INCHES X 3 INCHES, 5 INCHES X 5 INCHES, AND 8 INCHES X 8 INCHES NaI(Tl) CRYSTALS AND FOR GAMMA RAYS UP TO 15 MeV

M. Giannini, P. R. Oliva, and M. C. Ramorino 20 Sep. 1969 60 p refs

(RT/FI(69)38) Avail: CFSTI

Photoefficiencies, peak to total ratios, and energy loss spectra for 3 in x 3 in, 5 in x 5 in, and 8 in x 8 in NaI(Tl) crystals were calculated. Results are given for a point source located at 10 cm and 30 cm from one crystal end, and for a broad parallel beam. The gamma-ray energy ranges between 2 and 15 MeV. Author

N70-30085# Comitato Nazionale per l'Energia Nucleare, Bologna (Italy). Centro di Calcolo.

SURF: A FORTRAN PROGRAM FOR THE COUPLED-CHANNEL CALCULATION OF THE PHOTOREACTION CROSS-SECTIONS IN THE ONE PARTICLE - ONE HOLE CONTINUUM APPROXIMATION

F. Fabbri, M. Marangoni, and A. M. Saruis 7 Jun. 1969 38 p refs

(RT/FI(69)29) Avail: CFSTI

The SURF program written for an IBM 7094 computer in FORTRAN 4 language is described. The program calculates the dipole photoreaction cross sections of doubly closed shell nuclei in the one particle-one hole continuum approximation. Author

N70-30096# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Lab. Nazionali di Frascati.

TWO BEAM TRANSVERSE COHERENT INSTABILITY IN COLLIDING BEAM RINGS

A. Renieri 9 Mar. 1970 23 p refs *Its* Nota Interna No. 467

(LNF-70/8) Avail: CFSTI

Transverse instability which can appear in the electron-positron or electron-electron storage rings is investigated. The instability can grow only when two beams are intersecting in the vacuum chamber. Mathematical models are derived to develop the method. R.B.

N70-30116# Syracuse Univ., N.Y. Dept. of Physics.

SPONTANEOUS BREAKDOWN OF WEAK AND ELECTROMAGNETIC INTERACTION SYMMETRY

J. Schechter and Y. Ueda [1970] 23 p refs Sponsored by AEC

(SU-1206-220; NYO-3399-220) Avail: CFSTI

A unified theory of the weak and electromagnetic interactions of leptons and hadrons is constructed. The underlying symmetry group is taken to be the SU(2) generated by the weak lepton currents and the hadronic Cabibbo currents. This symmetry is destroyed by the spontaneous breakdown mechanism. In the theory, the weak coupling constant is the same as the electromagnetic coupling constant and the mass of the charged intermediate boson is 37.4 GeV. Author (NSA)

N70-30132# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy).

ON A NEW INSTABILITY IN ELECTRON-POSITRON STORAGE RINGS: THE HEAD-TAIL EFFECT

C. Pellegrini 17 Jun. 1969 32 p refs *Its* Nota Interna 448

(LNF-69/45) Avail: CFSTI

Electron positron storage rings, assuming a single beam in which there is only one bunch, are discussed. The general equations of motion are given and reduced to a linear system of homogeneous equations. Only the case of transverse radial or vertical betatron oscillations are considered. The analysis is made for a one dimensional transverse oscillation and should be valid equally well for both radial and vertical betatron modes. It is shown that the head-tail effect does not introduce instabilities in a storage ring in which the change in beatron wave number with energy is zero. The problem is then reduced to the solution of an infinite set of linear homogeneous integral equations, whose eigenvalues determine the characteristics of the bunch motion. Two approximate solutions of the integral equations are given for the case in which only resonant types of forces act on the beam. Numerical estimates of the rise time and frequency shift due to the head-tail effect are made. These show that unmatched clearing electrodes of low Q resonant cavities, can introduce strong instabilities. The forces due to the electrodes or RF cavities are also evaluated. Author

N70-30134# Von Karman Inst. for Fluid Dynamics, Rhode Saint-Genese (Belgium).

CROSS SECTIONS FOR ENERGY TRANSFER IN CLASSICAL COULOMB COLLISIONS

P. C. T. de Boer Aug. 1968 54 p refs Sponsored by NSF

(VKI-TN-48) Avail: Issuing Activity

Gryzinski's derivation of cross sections for energy transfer is considered. An inconsistency in averaging over all possible collisions is removed. The cross section Q(U) for energy transfer of at least U is calculated for arbitrary mass ratio of the collision partners. The differential cross section omega(U) for energy transfer U follows by differentiation. Different expressions for Q and omega apply in various regions of a diagram, the coordinates of which represent nondimensionalized mass and nondimensionalized energy of the incident particle. Results are given for the strictly classical case, as well as for an empirical modification which is equivalent to one proposed by Gryzinski. After a consideration of various ways in which the results can be improved empirically, it is concluded that the most straight-forward procedure consists of calculating cross sections by scaling laws. Author

N70-30147# Uppsala Univ. (Sweden). Quantum Chemistry Group.

QUANTUM THEORY OF MANY-PARTICLE SYSTEMS Final Scientific Report, 1 Sep. 1968 – 31 Aug. 1969

Per-Olov Lowdin 31 Aug. 1969 21 p refs

(Grant AF-EOOAR-0043-69)

(AD-701110; AFOSR-70-0180TR) Avail: CFSTI CSCL 7/4

The report gives a survey of the research work in the quantum theory of matter carried out by the Uppsala Quantum Chemistry Group during the period September 1, 1-68 - August 31, 1969. The contents of 29 Preliminary Research Reports and 21 published papers is briefly reviewed. Author (TAB)

N70-30150# Tennessee Univ., Knoxville.
K(-) ABSORPTION ON NEON
Lee M. Tucker, Jr. (Ph.D. Thesis) Aug. 1969 84 p refs
(TID-25360) Avail: CFSTI

Results of a bubble chamber study of negative kaon meson interactions with neon nuclei are presented. The exposure was obtained in a 30-inch bubble chamber filled with a 24 mole per cent mixture of neon in hydrogen. The general systematics of negative kaon neon interactions are discussed and compared with results obtained in experiments with other nuclei. In particular, results on neutral lambda hyperon trapping (hyperfragment formation), single and multinucleon absorption rates, and the Sigma-hyperon-lambda hyperon conversion processes are discussed. Author (NSA)

N70-30187# Atomic Energy of Canada, Ltd., Chalk River (Ontario).
THE INFLUENCE OF A TRAVELLING RF WAVE ON THE CROSSED-FIELD MOTION OF AN ELECTRON
W. N. Selander Feb. 1970 43 p refs
(AECL-3559) Avail: CFSTI; Atomic Energy of Can., Ltd., Chalk River: $1.00

Consideration of the rotational motion of an electron in crossed electric and magnetic fields suggests that it may be subject to resonance with the Doppler frequency at which the electron encounters a travelling space harmonic wave. Although the general equations of the electron motion are non-linear and cannot be solved explicitly, results obtained for two linearized versions of the equations support this view. Calculations in two limiting approximations show that the subharmonic resonance of order two is likely to disrupt smooth electron trajectories, and that harmonic resonances may occur but are expected to have less effect on the electron motion. These results are of interest for considerations of efficiency and stability in crossed field devices. Author

N70-30199*# Scientific Translation Service, Santa Barbara, Calif.
DIFFERENCE BETWEEN THE CHARACTERISTICS OF INTERACTIONS OF PIONS AND NUCLEONS WITH ATOMIC NUCLEI [O RAZLICHII KHARAKTERISTIK VZAIMODEYSTVIYA PIONOV I NUKLONOV S ATOMNYMI YADRAMI]
V. A. Murzin et al Washington NASA Jun. 1970 13 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR Ser., Fiz. (Moscow), v. 33, no. 9, 1969 p 1454-1460
(Contract NASw-2035)
(NASA-TT-F-13068) Avail: CFSTI CSCL 20H

The application of a Wilson chamber and an ionization calorimeter to a study of pion and nucleon interactions with atomic nuclei at an energy of 200 GeV is reported. The characteristic features of pion collisions are revealed by statistically comparing the characteristics of colliding charged and neutral particles. It is found that a substantial proportion of pion collisions are asymmetrical in pion-nucleon interactions, but are symmetrical in collisions of a pion with a virtual-pion target, as are also the averaged nucleon-nucleon interactions in a center-of-mass system of two nucleons. It is also shown that the multiplicity of secondary particles in pion-pion collisions is half that in symmetrical collisions, while the mean energy of these particles in pion collisions is 2.5 times that in nucleon collisions. Author

N70-30214# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy).
THE ELECTRO-MAGNETIC FIELD OF AN INTENSE COASTING BEAM PERTURBATION IN THE PRESENCE OF CONDUCTIVE PLATES TERMINATED AT BOTH ENDS
A. G. Ruggiero and V. G. Vaccaro (Naples Univ.) 20 Nov. 1969 26 p refs *Its* Nota Interna 457
(LNF-69/70) Avail: CFSTI

The effect of conductive plates in circular particle accelerators or storage rings excited by some traveling wave beam perturbations is investigated. A circular geometry with the beam centered in a straight pipe is used and the analysis is extended to throbbing as well as to longitudinal beam oscillations. It is shown that the self-forces, which oscillate in both the longitudinal and transverse directions as perturbation, are not dependent on the plate longitudinal distribution. Author

N70-30236# Oak Ridge National Lab., Tenn.
HIGH-ENERGY INTERACTIONS OF GAMMA-QUANTA WITH NUCLEI
K. K. Gudima et al 5 Feb. 1970 8 p refs Transl. into ENGLISH from the Russian report
(ORNL-TR-2280; JINR-P2-4808) Avail: CFSTI

The calculation results are presented for the photo-nuclear reactions at high energies obtained by means of a cascade model. A good agreement of theory and experiment on the total characteristics both for light and heavy nuclei is noted. Author (NSA)

N70-30244# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PASSAGE OF RADIATION THROUGH A SUBSTANCE (SELECTED ARTICLES)
V. M. Galitskii et al 14 Nov. 1969 65 p refs Transl. into ENGLISH from the Russian
(AD-702149; FTD-MT-24-325-69) Avail: CFSTI CSCL 20/10

Contents: Angular and spectral distributions of Compton scattering of a strong electromagnetic wave by an electron; Coherence effect during the radiation of molecules; and Passage of coherent electromagnetic radiation through substance in conditions of multiphoton resonance. TAB

N70-30295# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
RESEARCH IN THEORETICAL PHYSICS Annual Report, 1 Apr. 1969 - 31 Mar. 1970
Jan. 1970 8 p refs
(Contract AT(30-1)-4076)
(NYO-4076-7) Avail: CFSTI

Research is reported on the combination of analyticity and symmetry properties into a unified scheme for the understanding of hadron interactions. A list of publications issued is appended. NSA

N70-30297# Chicago Univ., Ill.
STATISTICAL APPROACH TO THE VENEZIANO MODEL
L. N. Chang, P. G. O. Freund, and Y. Nambu Dec. 1969 11 p refs
(Contract AT(11-1)-264)
(COO-264-530; EFI-69-101) Avail: CFSTI

A statistical approach to dual (Veneziano) dynamics is proposed. It operates with hadrons of given temperature rather than specifying in detail all hadronic quantum numbers. Heavy resonance production predictions of the statistical approach are found to agree with experiment. Author (NSA)

N70-30329# Union Carbide Corp., Oak Ridge, Tenn. Computing Technology Center.
RESAP: A PROGRAM FOR THE LEAST SQUARES ANALYSIS OF GAMMA SPECTRA INVOLVING INTERMIXED STANDARD SAMPLES
A. A. Brooks, A. Hume, and B. J. Handley 19 Mar. 1970 76 p
(Contract W-7405-eng-26)
(CTC-25) Avail: CFSTI

The Radiation Ecology Spectra Analysis Program, RESAP, was written to provide for a linear least squares analysis of data obtained from unknown samples, standard samples and background samples which were run in an intermixed fashion. The program, while not providing any new analytical procedures, was implemented in a fashion to provide for (1) a variety of input situations, (2) a choice of background treatment, (3) a criteria for channel elimination, (4) a rejection of nonsignificant parameters, (5) the correction for decay of radioactive species, (6) the pooling of replicates, and (7) the rejection of spectra. The program assumes a linear model for the counts integrated over the counting interval and relates the concentrations back to a zero time. Dual detectors are corrected for gain shift and the dual counts are summed and treated as one response. A brief discussion of the method is given, followed by a description of input and program options. The program listings are given followed by sample data sheets and sample test cases. Author (NSA)

N70-30403# Kansas Univ., Lawrence. Nuclear Physics Lab.

SPIN ASSIGNMENTS OF STATES IN Mg-24 FROM AN ANALYSIS OF DOPPLER BROADENED GAMMA RAYS

R. W. Krone, P. M. Cockburn, and W. J. Stark [1969] 21 p refs
(Contract AT(11-1)-1120)
(COO-1120-91) Avail: CFSTI

The spins of the Mg-24 states at 12.74, 12.85, and 12.97 MeV excitation, which are populated in the Na-23(proton, alpha gamma)Ne-20 reaction, have been determined to be 2(+), 2(−), and 2(−), respectively, from alpha − gamma correlation measurements. The correlation is measured simply by observing the 1.63-MeV gamma ray at 0° and analyzing the gamma-ray line shape in terms of the possible spins of the Mg-24 states. Author (NSA)

N70-30418# Hamburg Univ. (West Germany). Mathematisch-Naturwissenschaftliche Fakultaet.

THE n GAMMA ANGULAR CORRELATION MEASUREMENTS OF THE REACTION Mn-55(p,n GAMMA)Fe-55 [N-GAMMA WINKELKORRELATIONSMESSUNGEN AN DER REAKTION MN-55(P,N GAMMA)FE-55]

Frank Loechner (Ph.D. Thesis) 1969 61 p refs In GERMAN
Avail: CFSTI

An angular correlation experiment was performed for the Mn 55 (p,n gamma) Fe 55 fact reaction, when the first energy level of the Fe 55 residual nucleus was excited. It was possible to determine the direct reaction parts not only externally, but also within the resonance of the intermediate nucleus. This is always valid when the gamma transition originates from a level with spin 0 or 1/2. In this case an isotropic gamma-angular dependance arises for compound nuclear reactions. ESRO

N70-30459# Hamburg Univ. (West Germany). Mathematisch-Naturwissenschaftliche Fakultaet.

THE REACTION PI(-) P YIELDS PI(-) P PI (+) AT 11 GeV/c [DIE REAKTION PI(-) P YIEDLS PI(-) P PI(+) PI(-) BEI 11 GeV/c]

Peter von Handel (Ph.D. Thesis) 1969 172 p refs In GERMAN
Sponsored by Bundesmin. fuer Wiss. Forsch.
Avail: CFSTI

The properties of the reaction pi (-) p yield pi (-) p pi (+) pi (-) due to a 11 GeV/c incident negative pion impulse were investigated. After describing experimental details the peripheral properties of this reaction and the distributions of the separate particles are discussed. ESRO

N70-30461# Hamburg Univ. (West Germany). Mathematisch-Naturwissenschaftliche Fakultaet.

INVESTIGATIONS OF THE REACTIONS Be-9(n,d)Li-8 AND B-11(n,alpha)Li-8(beta) Be-8(2 alpha) WITH MEDIUM FAST NEUTRONS [UNTERSUCHUNG DER REAKTIONEN Be-9(n,d)Li-8 UND B-11(n,alpha)Li-8(beta) Be-8(2 alpha) MIT MITTELSCHNELLEN NEUTRONEN]

Wolfgang Scobel (Ph.D. Thesis) 1969 69 p refs In GERMAN
Avail: CFSTI

Equipment was developed to measure the neutron-induced reactions giving Li-8 residual nuclei. After equipment tests and recording of the Be-8 yields 2 alpha decay spectrum, the reactions Be-9(n,d) Li-8 and B-11 (n, alpha) Li-8 (beta) Be-8 (2 alpha) in the neutron energy range E sub n = 15.5 to 19 MeV were investigated. The qualitative aspects of the reaction sequence are discussed. ESRO

N70-30483# Melbourne Univ., Parkville (Australia). School of Physics.

STRUCTURE IN THE GIANT RESONANCE OF Pd 108 AND OF Pd 110

T. K. Deague, E. G. Muirhead, and B. M. Spicer 1969 21 p refs Sponsored by AROD
(UM-P-69/18) Avail: CFSTI

The Pd-108 photoneutron cross section was measured from threshold to 24.5 MeV by direct neutron detection. The Pd-108(gamma,proton) and Pd-110(gamma,neutron)Pd-109m cross sections were measured from threshold to 29 MeV by counting residual gamma-activity. The dynamic collective model predictions of Huber for Pd-108 and Pd-110 are in reasonable agreement with these cross sections in the giant resonance region, but a large amount of observed strength at energies less than 14 MeV and greater than 20 MeV is not accounted for by the model. The relative strengths of the proton and neutron production cross sections in Pd-108 are shown to be consistent with Morinaga's concept of an isospin-split giant resonance. Similar agreement is demonstrated for Rh-103, Zr-90, and Cu-65. However, the relative strengths in Ni-58 are found to be inconsistent with this concept. Author (NSA)

N70-30500# California Univ., Berkeley. Lawrence Radiation Lab.

SPECTRA AND KINETICS OF THE HYDROPEROXYL FREE RADICAL IN THE GAS PHASE

Thomas Theodore Paukert (Ph.D. Thesis) Nov. 1969 119 p refs
(Contract W-7405-eng-48)
(UCRL-19109) Avail: CFSTI

The absorption spectrum of the hydroperoxyl radical (HO2) was obtained by the molecular-modulation technique. The radical was formed by the photolysis of hydrogen peroxide at 2537 A and by the photolysis of ozone in the presence of hydrogen peroxide at 2537 A. The vibrational frequencies of HO2 have been observed to be 1095, 1390, and 1/3410 cm. Details of the vibrational spectrum are consistent with the molecular geometry: H-O bond distance 0.96 A, O-O bond distance 1.3 A, and H-O-O angle approximately 108 deg. The absorption spectrum of HO2 in the ultraviolet has a maximum at 2100 A. Kinetic analysis of the modulated absoprtion signals shows that the HO2 radical decays by a process second order in HO2 concentration. The rate constant for the disproportionation reaction HO2 + HO2 yields H2O2 + O2 was found to be 3.6 + or − 0.5 × 10 to the minus 12th power cu cm/molecule-sec in agreement with a reported value of 3 × 10 to the minus 12th power cu cm/molecule-sec. The absorption coefficient of HO2 at 1/1420 cm, the absorption maximum of the 1/1395 cm band is approximately 5 × 10 to the minus 20th power sq cm/molecule. The absorption coefficient at 2100 A is 4.5 × 10 to the minus 18th power sq cm/molecule. Author

N70-30509# National Bureau of Standards, Boulder, Colo. Inst. for Basic Standards.

MICROWAVE SPECTRAL TABLES. VOLUME 3: POLYATOMIC MOLECULES WITH INTERNAL ROTATION

Paul F. Wacker, Marian S. Cord, Donald G. Burkhard, Jean D. Petersen, and Raymond F. Kukol Jun. 1969 276 p refs
(NBS-MONOGRAPH-70-Vol-3) Avail: SOD $4.25

Measured frequencies, assigned molecular species, and assigned quantum numbers are given for about 9,000 spectral lines of polyatomic molecules with internal rotation observed by coherent radiation techniques. Molecular data, such as rotational constants, dipole moments, and various coupling constants, determined by such techniques, are also tabulated. Author

N70-30529# California Univ., Berkeley. Lawrence Radiation Lab.
INTENSITY ANALYSIS OF LOW ENERGY ELECTRONS DIFFRACTED FROM SINGLE CRYSTAL SURFACES
Helen Honora Farrell (Ph.D. Thesis) Nov. 1969 327 p refs
(Contract W-7405-eng-48)
(UCRL-19087) Avail: CFSTI

The intensities of several of the low index low energy electron diffraction beams from the (100) faces of aluminum and palladium were measured. These were compared with data already existing in the literature for several other face centered cubic (fcc) metals. Diffraction mechanism based on multiple scattering theory were assigned to the various intensity maxima observed in the very low energy region. Model calculations of the intensities based on simple multiple scattering theory were performed. The agreement between the calculated and the observed values was limited by the degree of sophistication of the model atomic potentials employed. The intensities of the LEED beams from the structured surfaces on palladium and platinum were measured and compared with trends predicted from multiple scattering theory. Simple calculations were performed for oxygen chemisorbed on the (100) face of the body centered cubic (bcc) metals in the primary stage of oxidation. One model was suggested on the basis of the calculations and existing experimental data. Author

N70-30552# Fraunhofer-Gesellschaft, Stuttgart (West Germany). Inst. fuer Physik und Chemie der Grenzflaechen.
THE SEDIMENTATION OF SOLID STATE BODIES IN POWDER FORM [ZUR SEDIMENTATION PULVERFOERMIGER FESTKOERPER]
G. A. Dyckerhoff and P.-J. Sell *In its* Examples of Appl. Res. Jun. 1969 p 11-14 refs In GERMAN (See N70-30551 15-34)
Avail: CFSTI

The sedimentation and agglomeration behaviors of different solid state bodies in various fluids is a typical boundary surface energy problem. For solid state bodies with high boundary surface energy (surface tension higher than water), the sedimentation behavior depends on the polarity (sum of all intramolecular interactions) of the fluid. The sedimentation behavior of NaF and glass powder was investigated for different fluids. ESRO

N70-30576# Fraunhofer-Gesellschaft zur Forderung der Angewandten Forschung e. V., Grafschaft (West Germany). Inst. fuer Aerobiologie.
DOSIMETRY OF MEDIUM FAST NEUTRONS WITH ACTIVATION PROBES [DOSISMESSUNG MITTELSCHNELLER NEUTRONEN MIT AKTIVIERUNGSSONDEN]
K. Brand *In its* Examples of Appl. Res. Jun. 1969 p 148-152 refs In GERMAN (See N70-30551 15-34)
Avail: CFSTI

It is shown that the dosimetry of medium fast neutrons can be performed by measuring the neutron flux and the energy distribution of the applied neutrons with a probe and an example is discussed. ESRO

N70-30594# California Univ., Berkeley. Lawrence Radiation Lab.
FOIL THICKNESS DETERMINATION FROM SINGLE CRYSTAL DIFFRACTION PATTERNS
W. L. Bell and G. Thomas Aug. 1969 4 p refs Presented at the 27th Ann. Electron Microscopy Soc. of Am., St. Paul, 26-29 Aug. 1969
(Contract W-7405-eng-48)
(UCRL-18865; CONF-690810-3) Avail: CFSTI

Methods of obtaining diffraction patterns from which measurements can be made of the deviation parameters necessary are briefly discussed as well as methods of applying a formula for calculating crystal thicknesses. Author

N70-30595# California Univ., Berkeley. Lawrence Radiation Lab.
SPECTROSCOPIC INVESTIGATION OF SOME HIGH TEMPERATURE SPECIES TRAPPED IN LOW TEMPERATURE MATRICES
John Ling-Fai Wang (Ph.D. Thesis) Oct. 1969 129 p refs
(Contract W-7405-eng-48)
(UCRL-19093) Avail: CFSTI

Absorption studies were made of Mg, Ca, Cd, Pb, Ba, and Ag atoms in rare gas matrices. Different multiplets are observed in different types of transitions. The synthesis of high temperature species such as MgO, CaO, and BaO by matrix trapping of atoms or molecules and reactions upon warming to diffusion temperatures were carried out in an effort to establish the ground electronic states. Author

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N70-29219# Naval Postgraduate School, Monterey, Calif.
LANGMUIR PROBE DIAGNOSTICS OF FLUCTUATION IN A REFLEX ARC NITROGEN PLASMA
Thomas James Haycraft (M.S. Thesis) Jun. 1969 58 p refs
(AD-701669) Avail: CFSTI CSCL 20/9

A reflex arc nitrogen plasma in a longitudinal magnetic field has been investigated by means of cylindrical Langmiur probes. Magnetic fields varying from 2400 gauss to 6600 gauss were studied. A radial profile of electron temperature and space potential was obtained as an aid to understanding the inner and outer rotational fluctuations previously noted to be characteristic of the reflex arc column. The effect of crossed magnetic and electric fields resulting in E x B particle drift has been proposed as the primary mechanism of the outer rotational fluctuation, while the inner rotation mechanism has been proposed to be the j x B force of the magnetohydrostatic equation of a plasma in equilibrium. Author (TAB)

N70-29279 Dartmouth Coll., Hanover, N.H.
WAVE-PARTICLE INTERACTIONS IN A MAGNETOPLASMA
Chang-yao Wang (Ph.D. Thesis) 1969 90 p
Avail: Univ. Microfilms: HC $4.60/Microfilm $3.00 Order No. 69-21233

A calculation is made of the velocity and orbit perturbations of a charged particle due to the presence of an arbitrary wave (either electromagnetic or electrostatic) of small amplitude propagating in a plasma permeated by a static magnetic field. It is assumed that the velocity and orbit perturbations are first-order quantities, i.e., the velocity perturbation is small compared to the zero-order initial particle velocity and the orbit perturbation is small compared to the wavelength. By use of the calculated perturbations, in velocity and in orbit, the power flow to the particles is determined by computing first the rate of change of the energy of a single charged particle. The result is then averaged over initial position and initial velocity phase and finally over velocity space. The result is applicable to any shape of the initial velocity distribution of the charged particles as long as it satisfies the zero-order Vlasov equation and has a finite thermal spread along the static magnetic field. Dissert. Abstr.

N70-29343# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STUDY OF PLASMA CLUSTERS (SELECTED ARTICLES)

N. A. Khizhnyak et al 18 Jul. 1968 92 p refs Transl. into ENGLISH from the Russian
(AD-683168; FTD-MT-24-138-68) Avail: CFSTI CSCL 20/9

Contents: The influence of dissipative processes and gas kinetic pressure on the magnetic moment of a puff; On the question of adiabaticity of the motion of plasma puffs in a longitudinal magnetic field; The interaction of plasma puffs with an axisymmetric magnetic field; and The structure of plasma puffs. TAB

N70-29347# Michigan Univ., Ann Arbor.

MICROINSTABILITIES IN INHOMOGENEOUS PLASMA

Progress Report, 1 May 1969 – 31 Jan. 1970

Terry Kammash 31 Jan. 1970 10 p refs
(Contract AT(11-1)-1478)
(COO-1478-6) Avail: CFSTI

Microinstabilities that occur in open-ended and toroidal devices and Astron were studied. The highlights of these studies are presented: (1) shear stabilization of drift waves, (2) Astron related instabilities, (3) instabilities in finite mirror geometry, (4) convective and absolute instabilities in two dimensional geometry and (5) nonlinear theory and plasma turbulence. NSA

N70-29350# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ACADEMY OF SCIENCES OF THE USSR, SIBERIAN BRANCH, NEWS, NO. 3. TECHNICAL SCIENCES SERIES, NO. 1, 1967 (SELECTED ARTICLES)

Sep. 1968 91 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Sibirsk. Otd., Ser. Tekhn. Nauk, no. 1, 1967 p 15–23, 45–46, 60–69, 91–97, 102–111, 129–138
(AD-685506; FTD-MT-24-219-68) Avail: CFSTI CSCL 13/1

Contents: Certain results of investigation of an automatic current stabilization system for electric-arc gas heaters; Generalized characteristic if a sectional electric-arc gas heater with vortex-stabilized electrical arc; Regulation of arc voltage in a two-chamber plasmatron by changing the gas flow ratio through vortex chambers; Comparative characteristics of two-chamber and bilateral plasmatrons; Theoretical and experimental investigations of volt-ampere characteristics of lithium plasma sources; Nonstationary processes in electric-arc heaters; Electrode voltage drops during interaction of plasma with electric field in an electric discharge tube; Investigation of arc electrode heating in a moving plasma. TAB

N70-29381 Columbia Univ., New York.

DRIFT WAVE FLUCTUATIONS AND ANOMALOUS DIFFUSION IN A FULLY IONIZED CESIUM PLASMA

John Edmond Ivers Walsh (Ph.D. Thesis) 1969 143 p
Avail: Univ. Microfilms: HC $6.80/Microfilm $3.00 Order No. 69-20195

The diffusion of a fully ionized plasma across a magnetic field has been related to the experimentally determined properties of the density fluctuations in a single ended Q Machine. A Cs plasma with a density No = 3 × to the 10th power/cu cm, temperature approximately 2300 deg magnetic field approximately 3KG with ion sheaths at the end plates was used. Under these conditions a broad spectrum of low frequency fluctuations with very little discrete content was observed. A phenomenological model for the fluctuations, based on the properties of drift waves and which takes into account the anomalous diffusion caused by the waves, is introduced and is used to associate the measured fluctuations with a continuous spectrum of drift waves. The fluctuations are studied with both spectral and correlation techniques. Dissert. Abstr.

N70-29522# Sandia Corp., Albuquerque, N.Mex.

ON THE APPROXIMATE SCATTERING CROSS SECTION OF AN ELECTRICALLY LARGE, RADIALLY INHOMOGENEOUS SPHERE

Charles W. Harrison, Jr. and S. R. Seshadri (Wisconsin Univ., Madison) 12 Mar. 1969 17 p refs
(SC-DC-69-1720) Avail: CFSTI

The complex reflection coefficient Gamma of a planer plasma model infinite in two dimensions is used to obtain approximately the radar cross section of an electrically large radially inhomogeneous sphere. The wave impedance or generalized surface impedance concept is employed. The procedure consists of solving the Riccati differential equation for the reflection coefficient applying to the slab model using the completely arbitrary electron density-collision frequency profiles selected for the sphere. The wave impedance corresponding to Gamma is calculated. The exterior boundary value problem of the sphere is then solved. Only spherical Bessel and Hankel functions of integer order and real argument appear in the problem. The radar cross section of the sphere is thus expressed in terms of the reflection coefficient of the plane. Author (NSA)

N70-29546# Oak Ridge National Lab., Tenn.

REVISED FORMULATION OF THE KINETIC PLASMA THEORY

Jacob Neufeld Feb. 1970 25 p refs
(Contract W-7405-eng-26)
(ORNL-4474) Avail: CFSTI

Using the Maxwellian macroscopic approach and analyzing the formulation of the dielectric constant, it is shown that the concept of energy has not been properly incorporated into the current kinetic plasma theory. The difficulties are due to a Boltzmann collisional term, which accounts for a change in the velocity distribution due to collisions alone. If one attempts to rephrase the Boltzmann – Valsov theory in terms of the Maxwellian macroscopic formulation, one obtains an expression for energy which is not consistent with the meaning of this concept in generalized dynamics. In a revised version developed in this analysis the Boltzmann collisional term has been eliminated, and an appropriate collisional operator is introduced that is believed to describe collisional processes in a plasma more adequately. It is assumed that the collisional operator can be applied directly to the electrical intensity of the field interacting with the plasma and is effective in transforming the intensity in a collisionless plasma into a corresponding intensity in a collisional plasma. At the same time the relationship between the electron velocity distribution function and the field intensity is considered to be the same, whether there are collisions or not. Author (NSA)

N70-29584# National Bureau of Standards, Washington, D.C.

ARC SOURCE FOR HIGH TEMPERATURE GAS STUDIES

John B. Shumaker, Jr. *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 3 p refs Repr. from Rev. Sci. Instr., v. 32, no. 1, Jan. 1961 p 65–67 (See N70-29554 15-14)
Avail: SOD $4.75

A wall-stabilized water-cooled copper ring type arc source is described which operates stably in apparently any gas for periods of an hour or more at currents up to 100 amp. Arc temperatures obtained spectroscopically by absolute line intensity and line profile methods are given for the arc in nitrogen at 92 amp. Author

N70-29585# National Bureau of Standards, Washington, D.C.

ARC MEASUREMENT OF SOME ARGON TRANSITION PROBABILITIES

C. H. Popenoe and J. B. Shumaker, Jr. *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 15 p refs Repr. from J. Res. Natl. Bur. Std. A. Phys. and Chem., v.

69A, no. 6, Nov.-Dec. 1965 (See N70-29552 15-14)
Avail: SOD $4.75

Transition probabilities and line shape parameters for three argon lines were measured in a wall-stabilized argon arc containing a trace of hydrogen. The H beta line shape measurement and the assumption of local thermodynamic equilibrium provided the determination of the argon level populations. From these three lines ten other argon line transition probabilities have been obtained by relative measurements in a pure argon arc. The results are compared with those of other investigators and sources of error are discussed. Author

N70-29604# Air Force Systems Command, Wright-Patterson AFB, Ohio. Air Force Aero Propulsion Lab.

EXPERIMENTAL STUDY OF A HOLLOW-CATHODE ARGON ARC PLASMA Technical Report, Jul. 1966 - Jun. 1968

James F. Holt and Ellsworth L. Boyer Sep. 1969 30 p refs
(AD-700307; AFAPL-TR-69-76) Avail: CFSTI CSCL 20/9

A set of coaxial cathode tubes produced a plasma having the same characteristics as the plasma from a tubular hollow cathode. Measurements of the plasma characteristics by microwave interferometry, plasma sweeper, Langmuir probe, and measurements made with a new plasma tool--a plasma scanner--showed that the plasma is nearly completely ionized at 10 to the 13th power/cc ion density. The electron beam, originating in the cathode, was detected by means of the scanner. The electrons in the beam attain energies as high as two-thirds of the arc voltage drop. The ion temperature of 6.9 electron volts, which was deduced from plasma sweeper measurements and diffusion theory, could result from directed ion drift; the electron temperature of the plasma is 3 electron volts. Author (TAB)

N70-29672# Oak Ridge National Lab., Tenn.

MICROINSTABILITIES IN INHOMOGENEOUS PLASMAS: THEORY

C. O. Beasley, W. M. Farr (Arizona Univ., Tucson) and H. Grawe (Inst. fuer Plasmaphysik, G.m.b.H.) 12 Feb. 1970 20 p refs
Submitted for publication Sponsored by AEC
(PB-189693; ORNL-TM-2852) Avail: CFSTI CSCL 20I

A formalism is presented for the determination of unstable electrostatic oscillations in a model mirror-confined plasma with a Gaussian density variation of arbitrary scale length along the magnetic field. A formal solution to the collisionless Boltzman equation is obtained for a plasma confined in a parabolic well. Using this solution, one may numerically solve Poisson's equation to obtain the eigen-functions (perturbed potentials) and eigenvalues (densities) of the system for a given frequency and growth rate. As no mathematical limits on plasma length exist for obtaining these solutions, one may recover the infinite-plasma results in the limit of very long plasmas. Author (USGRDR)

N70-29710# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.

THE ELECTRON ENERGY EQUATION FOR AN ATOMIC RADIATING PLASMA

S. S. R. Murty Jul. 1969 24 p refs
(AE-248-A) Avail: CFSTI

A radiation loss term appears in the electron energy equation due to the inelastic collisions. Using a simple atomic model suggested for hydrogenic gases, the radiation loss term valid for all optical thickness is obtained. It turns out that the radiation loss term can be neglected only for rapidly decaying or fast growing plasmas. Emission from optically thin plasmas is considered in detail. It is shown that to obtain the total continuum radiation loss it is unnecessary to use Kramers-Unsold approximation because the exact value can be obtained very simply. Author

N70-29722# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EXPERIMENTAL DETERMINATION OF ELECTRON CONCENTRATIONS AND EFFECTIVE FREQUENCIES OF ELECTRON COLLISIONS WITH NEUTRAL PARTICLES IN AIR, N2, O2, CO, ARGON, AND CO2 BEHIND SHOCK WAVES

Yu. S. Lobastov 1 Oct. 1969 23 p refs Transl. into ENGLISH from Publ. 'Issledovaniya po Fizicheskoi Gazodinamike' Moscow, Nauka, 1966 p 119 130
(AD-700370; FTD-HT-23-943-68) Avail: CFSTI CSCL 7/4

Measurement of radio-wave absorption simultaneously at two frequencies of 37,500 MHz and 18,750 MHz behind a reflected wave in a shock tube indicated that equilibrium ionization is achieved in air and in nitrogen during times of 70-17- Mu sec at 2800-4800 degrees K and at pressures of 0.3-6.20 atm. Comparison of absorption curves with Topler scan of the process of shock wave reflection from the end of a tube made it possible to explain the significant increase of conductivity after it reached an equilibrium value as a result of the additional heating of the gas by the shock wave being reflected from the interface. The measured values of effective cross-sections of electron collisions with neutral particles in air, nitrogen and CO are quite close to the data found in other papers. However, the cross-section tends toward a sharper increase in nitrogen at temperatures higher than 4000K. Cross-section values in molecular oxygen and in CO2 were significantly less in the present investigations than those found by others. Author (TAB)

N70-29796*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

CALCULATIONS OF ASTROPHYSICAL PARTITION FUNCTIONS

M. J. Hagyard 16 Feb. 1970 22 p refs
(NASA-TM-X-53984) Avail: CFSTI CSCL 20I

A method for the calculation of the internal energy partition function of an atom or ion immersed in a plasma is presented. Sample calculations are made at various temperatures and electron pressures, and the numerical results are compared with those of other authors. The importance of the contributions of higher parent terms is clearly demonstrated. Author

N70-29803# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

CONICAL ELECTROSTATIC PROBES IN A CONTINUUM FLOWING PLASMA

John K. Dukowicz Jan. 1970 62 p refs
(Contract DAHC60-68-C-0016)
(AD-701083; CAL-AN-2755-Y-1) Avail: CFSTI CSCL 20/9

A theory is presented for electrostatic probes used in continuum flowing plasmas under conditions when charged particle diffusion effects can be neglected in comparison with the effects of convection and the electric field. The theory is applied to the case of a 10 degree half-angle conical probe in an incompressible, inviscid flow field. Calculated results are presented for a range of parameters. The theoretical results are compared with the results of shock tube experiments with conical probes in which the electron number density was measured independently by microwave interferometers operated at Ka-band and X-band. It is found that while the qualitative behavior of the probe current is well described, the electron number density predicted by the theory is approximately twice the expected value on the average. This discrepancy is believed to be primarily due to the difference between the actual supersonic flow field and the assumed flow field. Author (TAB)

N70-30133 National Lending Library for Science and Technology, Boston Spa (England).

INVESTIGATION INTO HEAT TRANSFER IN THE CATHODE SPOT OF THE HIGH-CURRENT BLOWN ELECTRIC ARC [ISSLEDOVANIE TEPLOODVODA V KATODNOM PYATNE SILNOTOCHNOI OBDUVAEMOI

ELEKTRICHESKOI DUGI]
A. S. Shaboltas et al 23 Jan. 1970 9 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (Belorussia SSR), v. 15, no. 6, Dec. 1968 p 1009 – 1013
(NLL-SMRE-Trans-5794-(8313.4)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

Equipment and techniques for the investigation of heat transfer in the near electrode region of a high current blown electric arc are described. Experimental data are presented to demonstrate that there is a relationship between the heat transfer through the cathode and the current intensity with the air flow rate into the plasmatron chamber of 6.6 g/sec. and the external magnetic field intensity of 850 oersted. Author

N70-30242# Aerospace Corp., El Segundo, Calif. Lab. Operations.

INTEGRATED ELECTRON DENSITY MEASUREMENTS FROM REENTRY SHEATH INDUCED CHANGES IN SLOT ISOLATION, MAY–JULY 1969

Kurt E. Golden and Gordon E. Stewart 31 Dec. 1969 23 p refs
(Contract F04701-69-C-0066)
(AD-702438; TR-0066(5220-10)-3; SAMSO-TR-70-83) Avail: CFSTI CSCL 16/4

The change in coupling between slot antennas on a sharp, slender, reentry vehicle can be used to determine the integrated electron density of a thin, turbulent boundary layer plasma. This coupling change is compared with the admittance change measured by a reflectometer for the same plasma conditions. The coupling measurement provides a direct on-board measurement of signal attenuation when the thin sheath criteria are satisfied. Author (TAB)

N70-30263# Massachusetts Inst. of Tech., Cambridge. Fluid Mechanics Lab.

AN ION TEMPERATURE SENSITIVE END EFFECT IN CYLINDRICAL LANGMUIR PROBE RESPONSE AT IONOSPHERIC SATELLITE CONDITIONS

Sidney D. Hester and Ain A. Sonin Sep. 1969 47 p refs
(Contract Nonr-1841(93))
(AD-701316; PUB-69-9) Avail: CFSTI CSCL 20/9

Computations and experiments are presented for an end effect which can dominate the ion current response of long, cylindrical Langmuir probes in high speed, collisionfree flows. The end effect, which takes the form of an increase in ion current when the probe is aligned with the flow direction, depends strongly on the plasma properties and flow speed, and can be large even for very long probes when the speed ratio is large and the probe radius small compared with the Debye length. Experimental data are compared with theory, and some apparently contradictory results reported in the literature are reconciled in terms of the end effect. Author (TAB)

N70-30351# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Technische Physik.

PHYSICAL PRINCIPLES OF MPD ENERGY CONVERSION WITH SPECIAL ATTENTION TO THE DETERMINATION OF PLASMADYNAMIC PARAMETERS AND THE RESULTS FROM THE ARGAS PROJECT [PHYSIKALISCHE GRUNDLAGEN DER MPD-ENERGIEWANDLUNG UNTER BESONDERER BERUECKSICHTIGUNG DER BESTIMMUNG PLASMADYNAMISCHER KENNGROESSEN UND DER MESSERGEBNISSE DER VERSUCHSANLAGE ARGAS]

T. Bohn (Ph.D. Thesis—Tech. Hochsch. Vienna) Oct. 1969 143 p refs In GERMAN
(JUL-619-TP) Avail: CFSTI

The physics of 4-component plasmas are outlined in relation to MPD energy conversion. Measurements of electron shock cross sections at the collision of seed material atoms (cesium) with rare gas atoms (argon and helium), as well as with the ions, are discussed. The determination of plasma conductivity, which is dependent on current density, the geometry of the discharge space, and the losses by radiation and ambipolar diffusion, is also considered. The ARGAS project for static and dynamic plasma measurements is described, and results are discussed. Author (ESRO)

N70-30361# Oak Ridge National Lab., Tenn. Thermonuclear Div.

THEORY OF HIGH-FREQUENCY INSTABILITIES IN MIRROR-CONFINED PLASMAS

Gareth Guest Mar. 1970 47 p refs Presented at 8th Fac.-Student Conf., Argonne, Ill., 18 29 Aug. 1969
(Contract W-7405-eng-26)
(ORNL-TM-2864; CONF-690828-1) Avail: CFSTI

The velocity-space instabilities of importance to mirror-confined fusion plasmas are reviewed briefly with an emphasis on the fundamental processes by which non-Maxwellian plasma constituents can transfer excess energy to plasma waves. The general dispersion relation and its electrostatic limit are discussed together with various aspects of wave-particle energy transfer. The basic notions are illustrated by application to flute-like modes, resonant and non-resonant loss-cone modes, drift-cone modes, negative-mass instabilities, and instabilities arising in finite-length plasma models. Author (NSA)

N70-30401# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Technische Physik.

CALCULATION OF THE ELECTRIC CONDUCTIVITY OF A PLASMA WITH SPECIAL REGARD TO THE EXCITATION LOSS AND THE DIFFUSION TO THE CHARGE CARRIERS [DIE BERECHNUNG DER ELEKTRISCHEN LEITFAEHIGKEIT EINES PLASMAS UNTER SPEZIELLER BERUECKSICHTIGUNG DES ANREGUNGSVERLUSTES UND DER DIFFUSION DER LADUNGSTRAEGER]

Christian Holzapfel (Ph.D. Thesis—Vienna Univ.) Oct. 1969 75 p refs In GERMAN; ENGLISH summary
(JUL-617-TP) Avail: CFSTI

The influence of radiation and electron diffusion on the electrical conductivity of an alkali rare gas plasma, was investigated. The scalar electrical conductivity of a plasma is given mainly by the electron density and if the electron temperature is high enough they are related by the Saha equation. The electron density is reduced by ambipolar diffusion of the charged particles out of the discharge volume and by the reduction of the electron temperature due to inelastic collisions or radiation. These two processes are important at low temperatures and in small geometries and calculations were carried out for a cesium argon plasma. Author (ESRO)

N70-30410# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Technische Physik.

THE TRANSPORT COEFFICIENTS OF A NEAR-EQUILIBRIUM IONISED MULTI-TEMPERATURE GAS MIXTURE IN A STEADY ELECTROMAGNETIC FIELD [DIE TRANSPORTKOEFFIZIENTEN EINES GLEICHGEWICHTSNAHEN IONISIERTEN MEHRTEMPERATURGASGEMISCHES IM STATIONAEREN ELEKTROMAGNETISCHEN FELD]

H. A. Claassen Oct. 1969 58 p refs In GERMAN
(JUL-620-TP) Avail: CFSTI

Under certain assumptions concerning the mean force path and mean force time of flight of particles of several gas components, the tensorial transport coefficients of an ionized, space charged, N-component, multitemperature gas mixture in a steady electromagnetic field, are given within the framework of the Boltzmann transport equation and the 13-moment approximation for near-equilibrium distribution functions. The results are applied to a three-component plasma. Author (ESRO)

N70-30494# Texas Univ., Austin. Electronics Research Center.
COMPUTER SIMULATION OF PLASMA INJECTION AND TRAPPING IN A LINEAR OCTUPOLE
George L. Cardwell, III and W. C. Duesterhoeft, Jr. 15 Oct. 1969 148 p refs
(Grants AF-AFOSR-0766-67; AF-AFOSR-1792-69)
(AD-703284; AFOSR-70-230TR; TR-79) Avail: CFSTI CSCL 20/9

The plasma model used in the simulation is a particle-like model. Several restrictions are placed on the model in order that it faithfully simulate the plasma. These restrictions are discussed in detail. The motion of the particles is determined by Newton's equation of motion and the Lorentz force law. The difficulties involved in computing the Coulomb interaction of the particles are discussed. An alternative procedure for computing the electrostatic particle interactions by solving Poisson'S equation is presented. A technique for machine solution of Poisson's equation is described in detail. The ethod is a modification of the technique given by Hockney. The computer techniques are applied to the study of the injection and trapping of a plasma in a linear octupole. The results of this analysis are presented and compared with the experimental results of Boyd. Physical arguments are given to explain the analytically and experimentally observed phenomena. Author (TAB)

N70-30544# Naval Postgraduate School, Monterey, Calif.
EHD RESEARCH Final Report, 1968 - 1969
Oscar Biblarz 30 Dec. 1969 165 p refs
(AD-700716; NPS-57Z19121A) Avail: CFSTI CSCL 20/9

The research in electrohydrodynamics is concerned with how charged particles can be generated in the laboratory with a potentially useful range of sizes, of charge, and of number density. It is suggested that refined measurement techniques are needed to check on just what is being injected into the flow. The effects of turbulence on the EHD process and, particularly, on breakdown are being studied. The report discusses in some detail the possible role of turbulence on the mean effective mobility of charged particles. On the experimental side, a laboratory facility was built and then improved by the addition of a larger test section and other equipment. Work is proceeding to further develop and refine the instrumentation. Two types of injectors were operated, namely, molecular and two phase, and the latter shows potential for efficient operation. It was concluded tentatively that turbulence in the carrier fluid increases its breakdown potential, and that turbulent air may be a suitable medium for the EHD energy conversion process. Author (TAB)

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N70-29227 Temple Univ., Philadelphia, Pa.
MAGNETIC PROPERTIES OF SUPERCONDUCTORS
Duane Ralph Aston (Ph.D. Thesis) 1969 163 p
Avail: Univ. Microfilms: HC $7.60/Microfilm $3.00 Order No. 69-18373

A comparison of experimental magnetization curves of superconductors with existing theories is presented. A series of measurements on PbIn alloys have yielded the thermodynamic critical field, the lower critical field, the upper critical field, the Ginzburg-Landau parameter k, the transition temperature, the specific heat coefficient gamma, and the normal state resistivity, as a function of temperature, alloy composition, specimen shape, and applied magnetic field. Discrepancies with theory were noted. These are attributed to strong coupling and Fermi surface effects not taken into account by existing theories. It was found that the Maki parameters are equal at all impurity compositions of PbIn alloys, as well as In+Bi(3at.%) at 4.2 K. This was established through reversible thermodynamic magnetization curves which resulted from sample jarring. A temperature-field dependent phase transformation has been discovered for both PbIn and InBi alloy specimens in which the sample underwent a transition from a Type 1 superconductor in the intermediate state to a Type 2 superconductor in the mixed state. Superheating effects were also observed in the PbIn alloy system. They strongly favor one of two current theories of superheating. Dissert. Abstr.

N70-29228 Temple Univ., Philadelphia, Pa.
SPIN-LATTICE RELAXATION OF ELECTRONS AND NUCLEI IN COPPER SULPHATE AND YTTERBIUM DOPED CALCIUM FLUORIDE BY NUCLEAR DYNAMIC POLARIZATION
Harvey Waldman (Ph.D. Thesis) 1969 86 p
Avail: Univ. Microfilms: HC $4.60/Microfilm $3.00 Order No. 69-19967

Dynamic polarization of protons in CuSO4.5H2O doped ZnSO4.7H2O and F-19 nuclei in Yb(+3) doped calcium fluoride (trigonal sites) was observed in the range of 1.6 K to 4.2 K. Concentration, temperature, and microwave power dependencies of the polarization and relaxation times of the nuclei are measured and these dependencies are deduced for the Cu(2+) and Yb(3+) electron relaxation times. Copper electrons are found to relax mainly by the direct process at low concentrations, while the Raman process is found at higher concentrations. The Orbach process is observed for ytterbium electrons above the range 3.6 K to 4.2 K. Below this range, the direct process predominates. All samples indicate spin diffusion limited processes. A general expression is derived for the Orbach process of a Kramer's salt, it is applied to Cu(+2) and Yb(3+) and compared with the values deduced from the measurements. The wave functions of the ground states of Yb(3+) in a trigonal site are calculated from ESR measurements and used in the above analysis. The first excited orbital level splitting of Ytterbium is calculated from the temperature at which the Orbach process relaxation rate becomes greater than that of the direct process. A lower bound for this splitting is obtained for copper. Dissert. Abstr.

N70-29253 State Univ. of New York at Buffalo.
GENERALIZED CRYSTAL FIELD THEORY
Prakash Chandra Trivedi (Ph.D. Thesis) 1969 128 p
Avail: Univ. Microfilms: HC $6.20/Microfilm $3.00 Order No. 69-20517

A modified molecular orbital theory, known as the expanded Hamiltonian-separated atom-molececular orbital or EH-SA-MO technique, was developed to show the effect of the neglect of the wave function overlap and the electron exchange on the results of the conventional crystal field theory. It was applied by them to calculate the interaction of a hydrogen atom in a 2p state and a hydrogen molecule in the ground state in two different simple nuclear configurations. In one case, the atom nucleus was taken to lie on the perpendicular bisector of the molecule axis, and in the other all the three nuclei were taken to lie on a line. The method is generalized for the p sub n atom-H2 molecule system. The results are evaluated analytically and numerically for a wide range of internuclear distances and presented graphically. Dissert. Abstr.

N70-29254 Stanford University, Calif.
KINETICS OF ANNIHILATION OF DISLOCATION DIPOLES IN LiF SINGLE CRYSTALS
Franklin Fong Ming Lee (Ph.D. Thesis) 1968 251 p
Avail: Univ. Microfilms: HC $11.50/Microfilm $3.25 Order No. 69-8215

The kinetics of annihilation of dislocation dipoles during isothermal annealing of LiF single crystals provides information from which the stress and temperature dependence of the dislocation velocity can be obtained. A new technique, which takes advantage of the self stresses acting on the dislocation dipole, was employed in the study of dislocation mobilities in the temperature range of 90 deg to 200 C. Using the etch-pit technique, the separation distances of dislocation dipoles were measured repeatedly after successive isothermal anneals. In order to analyze the experimental data, several theoretical models were formulated by taking into account the different geometries of dislocation dipoles and some empirical stress dependences of dislocation velocities. Among these, the model of an infinitely straight dipole is the easiest to handle, while the model of an elliptical half loop having equilibrium shape is probably most realistic. A thermodynamic analysis of the process of dislocation loop annihilation was made. On the basis of a thermodynamic argument a particular method is suggested for computing the self stresses or self forces in dislocation loops having equilibrium shape. Dissert. Abstr.

N70-29280 Temple Univ., Philadelphia, Pa.

THE ELECTRONIC STRUCTURE OF GOLD BY THE RELATIVISTIC KKR METHOD

Charles B. Sommers (Ph.D. Thesis) 1969 213 p
Avail: Univ. Microfilms: HC $9.70/Microfilm $3.00 Order No. 69-18374

The electronic band structure of Gold has been computed using a modified form of the KKR method. This modification includes the replacing of the Schroedinger equation with the full Dirac central field Hamiltonian and the use of four component spinor wave-functions. The energy bands are compared with the non-relativistic calculation of Schlosser using the same muffin-tin potential. The results of this calculation are in general agreement with the cross sectional areas of the Fermi surface as computed by the de-Haas Van Alphen measurements of Schoenberg. The optical measurements of Beaglehole are used in order to interpret the possible dipole transitions. It is conjectured on the basis of the calculated band gaps are of the order of 1 ev smaller than the peaks in the imaginary part of the dielectric constant. Dissert. Abstr.

N70-29287 Yeshiva Univ., New York.

IMPURITY SCATTERING IN SEMICONDUCTORS: PHASE-SHIFT APPROACH

Om Prakash Sinha (Ph.D. Thesis) 1969 85 p
Avail: Univ. Microfilms: HC $4.40/Microfilm $3.00 Order No. 69-21023

The eigenstates of a scattered Bloch electron from a localized impurity site were examined for a semiconductor having a multivalleyed structure in its conduction band. A reformulated Friedel sum rule for multivalley structure was stated and transport cross section expressed in terms of phase shifts. The sum rule was then applied to obtain a consistent cross section for neutral impurities. A theory for transport cross section which takes into account the complicated nature of the energy surface of a multivalleyed semiconductor, at least for the not too hot carriers was proposed. The usually ignored for the not too hot carriers was proposed; the usually ignored so called oscillatory term of Friedel Sum Rule was exploited to give additional constraints on the phase shifts, as well as more information on the modified scattering potential; and an entirely different expression for the screening of Coulomb potential from the usually accepted Debye screening was obtained and justified. Dissert. Abstr.

N70-29351# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PHYSICAL PROPERTIES OF ESPECIALLY PURE METALS AND SEMICONDUCTORS (SELECTED ARTICLES)

M. S. Saidov et al Jul. 1968 15 p refs Transl. into ENGLISH from the Russian
(AD-685518; FTD-MT-23-407-68) Avail: CFSTI CSCL 20/2

Contents: Growing of single crystals of silicon carbide of cubic modification; Influence of annealing of silicon in antimony vapor on the density of linear dislocations. TAB

N70-29427 National Lending Library for Science and Technology, Boston Spa (England).

DISORDER MODEL FOR A SEMICONDUCTOR WITH CHARACTERISTIC DEFECT CENTRES, TAKING CHROMIUM SESQUIOXIDE AS AN EXAMPLE

K. Hauffe et al 24 Feb. 1970 16 p refs Transl. into ENGLISH from Z. Phys. Chem. (Frankfurt), v. 198, no. 516, 1951 p 232-247
(NLL-CE-Trans-5211-(9022.09)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The but slight dependence of electrical conductivity of chromium sesquioxide on the partial pressure of the oxygen cannot be associated with the disorder mechanism of a p-type semiconductor when, at the same time, the absolute conductivity is relatively high. Only by assuming a disorder that is to a large extent independent of the oxygen partial pressure as in the disorder model of an intrinsic impurities semiconductor can the two effects be reconciled. This disorder model of the intrinsic impurities semiconductor chromium sesquioxide is explained by application of the mixed oxide semiconductor theory to Cr2O3 mixed oxide phrases. For the sharp decrease in conductivity with higher-valency additives, the numerical values of the intrinsic impurities concentration of the pure phase, the expected increase of conductivity on addition of lower-valency components, such as NiO, amounts to a maximum of about 3/4 of a power of ten is estimated. The independence of the electrical conductivity of Cr2O3 on ZnO additions raises the possibility of preferential ionic disorder. Author

N70-29473# Hughes Aircraft Co., Culver City, Calif. Electronic Properties Information Center.

LEAD TELLURIDE-TIN TELLURIDE, DATA SHEETS

M. Neuberger Jan. 1970 215 p refs
(Contracts F33615-68-C-1225; AF 33(615)-2460)
(AD-701075; EPIC-DS-164) Avail: CFSTI CSCL 20/12

The data sheets present a compilation of a wide range of electronic properties for lead telluride, tin telluride and the lead-tin-tellurium ternary system. The energy band structure is thoroughly reviewed and included are effective mass and dielectric constant. Electrical properties include mobility, resistivity, lifetime and piezoresistance. The various thermal and magnetic properties such as Debye temperature, thermal conductivity, phonon dispersion and the Seebeck, Nernst and Ettingshausen coefficients are reported. The g-factor and magnetic susceptibility are given. The optical properties, absorption, refractive index and reflectivity are reported; also photoconductivity, photoelectric emission and laser effects. Each property is compiled over the widest possible range of parameters, including bulk and film samples. A data table which includes a wide range of mechanical, physical and thermal properties is included as well as a summary of crystal structure and phase transitions. A general discussion of preparation methods and device applications is given. Author (TAB)

N70-29474# Lincoln Lab., Mass. Inst. of Tech., Lexington. Electronic Systems Div.

SOLID STATE RESEARCH, 1969, NO. 4 Quarterly Technical Report, 1 Aug. - 31 Oct. 1969

Peter E. Tannenwald 13 Jan. 1970 67 p refs
(Contract AF 19(628)-5167)
(AD-701022; ESD-TR-69-336) Avail: CFSTI CSCL 20/12

The report covers in detail the solid state research work at Lincoln Laboratory for the period 1 August through 31 October 1969. The topics covered are solid state device research, materials research, and physics of solids. Author (TAB)

N70-29503 West Virginia Univ., Morgantown.
PHONON FIELD THEORY FOR A DIELECTRIC CUBIC CRYSTAL
Edwin Duane Ball (Ph.D. Thesis) 1969 47 p
Avail: Univ. Microfilms: HC $3.00/Microfilm $3.00 Order No. 69-20699

Field theory methods, in particular S-matrix theory, have been applied to the phonons in a simple crystal model, treating them analogously to elementary particles. Interactions between the phonons arise because of the assumption of a third order term in the potential of the crystal. Feynman type rules for relating S-matrix elements to scattering diagrams are developed and then used to investigate renormalization properties of the theory. In the continuum limit the theory is proved to be nonrenormalizable. For the discrete theory renormalization of the coupling constant is calculated for the lowest order approximation. Also, it is shown how the thermal conductivity is determined by the S-matrix elements.
Dissert. Abstr.

N70-29521# Iowa State Univ. of Science and Technology, Ames.
LATTICE DYNAMICS OF YZn
Thomas Stephen Prevender (Ph.D. Thesis) Nov. 1969 123 p refs
(IS-T-344) Avail: CFSTI

A series of experiments and calculations have been performed involving the ordered alloy YZn. The primary experiment was a measurement of the phonon dispersion curves along symmetry directions by inelastic neutron scattering. A general sixth neighbor force constant model was found to be necessary to satisfactorily describe the dispersion curves. However, a Fourier analysis of the sums of the squares of the phonon frequencies along symmetry directions indicated that longer range forces were present. The long-range order parameter was determined by means of an X-ray diffraction experiment. A method of analysis of this experiment was derived that not only revealed the sample to be extremely well-ordered but also indicated that the mean square displacement of Y was greater than that of Zn. The analysis also yielded an approximate value for the sum of the mean square displacements. The elastic constants of YZn were determined by means of an ultrasonic pulse superposition technique. With the use of the measured elastic constants a simple first neighbor force constant model was devised to describe the lattice properties.
Author (NSA)

N70-29544# Dayton Univ., Ohio. Dept. of Physics.
LATTICE DYNAMICS OF CdS. PART 1: NEAREST NEIGHBOR APPROXIMATION
Eugene N. Frank Wright-Patterson AFB, Ohio ARL Nov. 1969 60 p refs
(Contract F33615-67-C-1027)
(AD-701043; ARL-69-0184) Avail: CFSTI CSCL 20/12

The report presents the first part of a study on the lattice dynamics of CdS and assumes only nearest-neighbor interaction between the ions. The structure of cadmium sulfide in its wurtzite form is discussed. A short discussion of the first Brillouin zone of the crystal is given. The equations of motion of the lattice are derived assuming a one parameter nearest neighbor type of potential. The usual form for displacements in a periodic potential is assumed. As there are four atoms in the basis, there are four independent vector displacements involved. The dynamical matrix obtained is diagonalized yielding the eigenvalues and eigenvectors of the matrix. The eigenvalues are the normal mode frequencies squared of the photons. The eigenvectors are closely related to the normal modes of the lattice. This relationship is demonstrated explicitly for the wave vectors at the gamma point of the Brillouin zone. Dispersion curves are given indicating the phonon energies predicted by this model for fourteen symmetry points of the Brillouin zone. It is found that this model gives only qualitative agreement with experiment.
Author (TAB)

N70-29596*# Northeastern Univ., Boston, Mass.
THE STUDY OF OPTICAL PROPERTIES AND COLLECTIVE OSCILLATIONS IN NEW SOLID STATE MATERIALS AS A FUNCTION OF TEMPERATURE USING INFRARED AND RAMAN TECHNIQUES Annual Report, 15 May 1969 – 14 May 1970
Clive H. Perry 14 May 1970 119 p refs
(Grant NGL-22-011-051)
(NASA-CR-86399) Avail: CFSTI CSCL 20L

A temperature dependent study of the vibrations of crystal lattices and low-lying electronic states was conducted using infrared and Raman light scattering techniques. The emphasis was placed on new materials which have useful applications such as low temperature filters for long-wave infrared radiation, new laser host-crystals, crystals as electro-optic devices and nonlinear effects. The materials of interest included various ferroelectrics (and antiferroelectrics), piezoelectrics, antiferromagnets, certain semiconductors and insulators. A basic understanding of the lattice dynamics and phonon structure of these systems are useful in explaining their optical properties and provide useful data for predicting general engineering and research applications. Author

N70-29602# Iowa State Univ. of Science and Technology, Ames.
A FORTRAN 4 CRYSTALLOGRAPHIC SYSTEM OF PROGRAMS FOR GENERALIZED SUPERPOSITIONS
Camden R. Hubbard and Robert A. Jacobson Nov. 1969 34 p refs
(Contract W-7405-eng-82)
(IS-2210) Avail: CFSTI

The system of three programs calculates symmetry and general superposition maps for triclinic, monoclinic, and orthorhombic space groups. The program GEN generates the basic direct access data set. The program SYMM calculates a direct access symmetry map. The program ALS calculates a superposition map using the minimum function with weighting, origin shift, and multiple superposition options. ALS uses direct access storage to keep computer storage at a minimum. A detailed description of the use of the programs together with symbolic program listings is supplied.
Author (NSA)

N70-29663# California Univ., San Diego. Dept. of Chemistry.
DECAY OF CORRELATIONS. 3: RELAXATION OF SPIN CORRELATIONS AND DISTRIBUTION FUNCTIONS IN THE ONE-DIMENSIONAL ISING LATTICE
Dick Bedeaux, Kurt E. Shuler, Irwin Oppenheim (MIT) 1969 41 p refs Sponsored in part by NSF Prepared in cooperation with MIT
(Contract N00014-67-A-0109-0010; ARPA Order 125)
(AD-701347; TR-2) Avail: CFSTI CSCL 20/12

The report describes the relaxation of the n-spin correlation function and distribution function for the Glauber model of the one-dimensional Ising lattice. It was found that new combinations of correlation functions (C-functions) and distribution functions (Q-functions) are more useful in discussing the relaxation of this system from initial non-equilibrium states than the usual cumulants and Ursell functions used in previous papers. TAB

N70-29723# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN INVESTIGATION OF STRAIN SENSITIVITY
A. N. Arseneva-Geil 16 Sep. 1969 9 p refs Transl. into ENGLISH from Leningrad Univ. Uch. Zap. (Leningrad), no. 336 p 157–159
(AD-700369; FTD-HT-23-421-69) Avail: CFSTI CSCL 20/12

The following findings are the result of experimental work with the tensoeffect of compacted lead sulfide powder: no matter what the initial resistance of the tensoelement (strain gage), its resistance-vs-pressure characteristics are linear; no definite relation between resistance and strain sensitivity was observed in specimens not thermally treated; specimen resistance linearly decreases as temperature increases within 240-330 K; up to 180K, the resistance linearly increases; the strain sensitivity slightly increases or remains constant within 290-330K; with a load current of 1 ma, the characteristics are still linear; some tensoelements can operate with currents of 10 ma; tensoelement resistances increase with time, their sensitivity remains constant; the characteristics of most specimens have improved with time; after a thermal (820K) treatment, the sensitivity reaches very high values, both sensitivity and resistance vary with time according to the same law which corresponds to Slaters barrier theory. Author (TAB)

N70-29773# California Univ., Berkeley. Lawrence Radiation Lab.
EFFECTS AND CONTROL OF SURFACE STATES DURING LITHIUM ION DRIFT IN SILICON
Robert P. Lothrop Nov. 1969 43 p refs
(Contract W-7405-eng-48)
(UCRL-19413) Avail: CFSTI

Parameters for fabrication of lithium-drifted silicon semiconductor detectors with good voltage and current characteristics are discussed. The nature of the intrinsic surface, evaluation of surface state effects, pre-drift surface treatment, and surface state control during drift by gas mixtures and by liquids are considered. NSA

N70-29797*# Autonetics, Anaheim, Calif. Physical Sciences Dept.
HETEROEPITAXY OF III-V COMPOUND SEMICONDUCTORS ON INSULATING SUBSTRATES Final Report
Harold M. Manasevit and Arthur C. Thorsen Jan. 1970 102 p refs
(Contract NAS12-2010)
(NASA-CR-86408) Avail: CFSTI CSCL 20L

Thick undoped GaAs films with room temperature mobilities between 5000 and 6000 sq cm/V-sec were grown on (0001) sapphire by the trimethylgallium(TMG)-arsine (AsH_3) process in the temperature range of 650 to 700 C. The studies show that by manipulation of the relative AsH_3-TMG concentration, it is possible to control to some extent the carrier concentration, resistivity, and conductivity type of the resultant films. Nucleation and early-stage growth studies reveal some details of the mechanisms of film formation and corroborate orientation relationship investigations that indicate (0001) Al_2O_3 as the preferred sapphire substrate for (111) GaAs growth. Preliminary studies using stoichiometric spinel ($MgAl_2O_4$) as substrates show that essentially equivalent GaAs films can also be grown on (110) spinel and it is concluded from the orientation studies that the factors which influence heteroepitaxial growth of GaAs are probably different from those in the heteroepitaxial Si system. Author

N70-29852# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
QUANTUM-ELECTRONIC THEORY OF AMORPHOUS CONDUCTORS [KVANTOVO-ELEKTRONNAYA TEORIYA AMORFNYKH PROVODNIKOV]
A. I. Guabanov 4 Dec. 1969 275 p refs Transl. into ENGLISH from the Russian
(AD-701968; FTD-MT-24-250-69) Avail: CFSTI CSCL 20/12

The work is a survey of experimental investigations of the electrical properties and structure of liquid metals, liquid and glass-like semiconductors. The electronic theory of amorphous bodies is systematically expounded: band structure of the energy spectrum of liquids, peculiarities of electron scattering in them, behavior of impurities in amorphous semiconductors, and the possibility of existence of amorphous ferromagnetic materials. The book is the first monograph devoted to the physics of amorphous conductors and is intended for theoretical physicists and experimenters, teachers and students of physical and certain engineering specialties, and researchers, dealing with liquid or amorphous semiconductors. Author (TAB)

N70-29858# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerper- und Neutronenphysick.
TABLES FOR CORRECTING THE SIZE EFFECT OF THE ELECTRICAL RESISTIVITY IN FOILS AND WIRES
F. Dworschak, W. Sassin, J. Wick, and J. Wurm Feb. 1969 60 p refs
(JUL-575-FN) Avail: CFSTI

Tables are given which allow the calculation of the electrical size effect of thin foils and wires. The tables were obtained by evaluating numerically the theory of Sondheimer. The presumptions for the application of the tables are discussed in detail. A summary of the parameters of this theory for different materials, which have been determined experimentally and reported in literature, is also included. Author

N70-29866*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FILAMENTARY CRYSTAL GROWTH ASSOCIATED WITH HYPERVELOCITY MICROPARTICLE IMPACT CRATERS
O. E. Berg and J. A. M. Mc Donnell Washington Jun. 1970 9 p refs
(NASA-TN-D-5824; G-982) Avail: CFSTI CSCL 20B

A filamentary crystal growth is associated with hypervelocity microparticle impacts upon copper foil. Consideration of facts concerning the projectile impacts and observations of their characteristics lead to a conclusion that they are copper whiskers formed by the condensation of the target material vaporized by the impact. Author

N70-29891# Pennsylvania State Univ., University Park. Materials Research Lab.
MATERIALS PREPARATION AND CHARACTERIZATION RESEARCH Technical Summary Report, 1 Jul. - 31 Dec. 1969
Rustum Roy 31 Dec. 1969 18 p refs
(Contract DA-49-083-OSA-3140; ARPA Order 338)
(AD-701932) Avail: CFSTI CSCL 20/2

Summaries are given of research in the following fields: Growth of large crystals (Growth of high-purity magnesium crystal, Gel growth of apatite, Crystal growth in gels, Growth of Cu dendrites from Tl solutions, Production and characterization of hydrocarbon films); Cathodoluminescence studies of willemite; Crystal chemistry (Synthesis and crystal chemistry of complex palladium oxides, Crystal structure of Mg_3TeO_6, Elastic constants of beryl); Defects and strain in polycrystalline materials; Gases in glass; Spectroscopic studies of glass structure; Chalcogenide glasses; and Non-crystalline material from the vapor phase. TAB

N70-29899# Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia).
LASAR RAMAN STUDY OF QUASI-SPIN WAVE HYDROGEN TUNNELING MODES IN KH2PO4 AND K02PO4
R. Blinc, D. Hadzi, B. Lavrencic, I. Levstek, and B. Zeks Feb. 1970 10 p refs Submitted for publication
(IJS-R-578) Avail: CFSTI

The low frequency laser excited Raman spectra of KH_2PO_4 and KD_2PO_4 single crystals were measured at room temperature for various orientations and a complete symmetry assignment of the observed modes was made. In addition to the strongly damped ferroelectric quasi-spin wave like proton mode of symmetry B2, a non-degenerate proton mode at 397/cm and a doubly degenerate proton mode around 80/cm of predicted symmetry properties were found. The frequencies of all these proton modes are reduced on deuteration by a factor of ten or more, thus demonstrating their collective proton tunneling nature. Author

N70-29912*# Scientific Translation Service, Santa Barbara, Calif.
ON THE PROPAGATION OF ELASTIC WAVES IN PIEZOSEMICONDUCTORS [O RASPROSTRANENII

UPRUGIKH VOLN V PYEZOPOLUPROVODNIKAKH]

V. V. Soroka Washington NASA May 1970 6 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Fiz. (Tomsk), v. 9, 1969 p 129 130
(Contract NASw-2035)
(NASA-TT-F-12977) Avail: CFSTI CSCL 20L

The general invariant expressions for the velocity and decay of elastic waves in piezoelectric media are derived. The study is based on joint solution of the Maxwell equations and equations of motion of the piezoelectric medium. Author

N70-29926# Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Inst. fuer Metallurgie.

STACKING FAULTS IN CLOSE-PACKED STRUCTURES [STAPELFEHLER IN DICHTESTEN KUGELPACKUNGEN]

E. M. Hoerl 1969 17 p refs In GERMAN; ENGLISH summary Submitted for publication
(SGAE-M-26/1969) Avail: CFSTI

A general symbolic representation is based on n-layer symbols assigned to points in a three-dimensional space. Graphical symbols are introduced in order to represent undisturbed structures, as well as stacking faults on a general basis. Author

N70-29953*# Kentucky Univ., Lexington. Dept. of Metallurgical Engineering and Materials Science.

RESEARCH STUDY OF STRUCTURAL DAMAGE PRODUCED IN SILICON SEMICONDUCTORS BY NEUTRON IRRADIATION Semiannual Report

Gordon A. Sargent [1970] 22 p refs Prepared for JPL
(Contracts NAS7-100; JPL-952561)
(NASA-CR-110240; TR-20-70-MET-9) Avail: CFSTI; Office of Res. and Eng. Serv., Publ. Serv., Coll. of Eng., Kentucky Univ., Lexington, Ky. 40506 CSCL 20L

The main objectives of this program are to attempt to determine the size, distribution, morphology, and structural characteristics of the regions of lattice disorder which are produced by bombarding lithium doped silicon solar cells with neutrons. The effects of annealing the cells after irradiation are also to be studied. The experimental work is being carried out entirely on the electron microscope using surface replication and thin film transmission techniques. Suitable etching techniques for preparing the surfaces of the samples for the electron microscopy have been developed. It has been observed that in the as-received lithium doped cells, the lithium is present as a precipitate particle, thus more lithium may be present in the cells than as determined by the usual resistivity measurements. Studies are continuing to investigate the effects of neutron irradiation. Author

N70-29961# Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia).

SPIN-LATTICE RELAXATION BY QUASI-SPIN WAVES IN ORDER-DISORDER TYPE FERROELECTRICS: POLARIZATION FLUCTUATIONS IN Ca2 Sr(C2H5CO2)6

R. Blinc, S. Zumer, and G. Lahajnar Jan. 1970 20 p refs Submitted for publication Sponsored in part by AEC
(IJS-R-575) Avail: CFSTI

If relaxation due to competing processes is not too fast such an unstable mode will dominate the magnetic dipolar or electric quadrupolar relaxation rate not only right at the Curie point, but also in its neighborhood. In such a case, the temperature dependence depends on the details of the interaction between the ferroelectric dipoles and the Brillouin zone size. The theory is applied to the case of ferroelectric di-calcium strontium propionate. This crystal exhibits an anomalous dip in temperature dependence on approaching Curie point which is due to magnetic dipolar coupling to an overdamped unstable quasi-spin wave mode. Author

N70-29969# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.

TEMPERATURE EFFECTS ON THE THERMOREFLECTANCE SPECTRA OF SILICON [EFFETTO DELLA TEMPERATURA SUGLI SPETTRI DI TERMORIFLETTANZA DEL SILICIO]

A. Balzarotti, M. Grandolfo, and P. Vecchia 1 Sep. 1969 21 p refs In ITALIAN; ENGLISH summary
(ISS-69/32) Avail: CFSTI

Temperature-modulated reflectance spectra of silicon in the 3.2/6.0 eV region, both at 77 K and at 203 K are presented. Temperature-modulation spectra of refraction index and of dielectric constant are also deduced. The results indicate the existence of critical points near 3.4 and 4.1 eV, and enable the calculation of the temperature coefficients of these critical points. Author

N70-30092*# Westinghouse Research Lab., Pittsburgh, Pa.

ZERO GRAVITY CRYSTAL GROWTH Final Report

M. Rubenstein, C. S. Duncan, and R. Mazelsky 29 Apr. 1970 90 p
(Contract NAS8-24509)
(NASA-CR-102731) Avail: CFSTI CSCL 20B

An operational unit for growing crystals in zero gravity is described. The unit is designed primarily to grow experimental crystals of gallium arsenide from a gallium solvent, but other crystals and solvents can be used with minor variations. Among phenomena that can be resolved under zero gravity conditions are the surface finish of grown crystals and effects of convection, the rate of heat and solute transfer unaided by convection, the rate and mechanism of seed dissolution in the cold portion of the ampoule, and the effect of both self-nucleated and seeded crystals in a convectionless environment on growth. R.F.

N70-30097# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Lab. Nazionali di Frascati.

THE TUNNEL EFFECT IN SUPERCONDUCTORS

N. Sacchetti 25 Feb. 1970 42 p refs Presented at Intern. School of Appl. Phys. Develop. of Appl. Superconductivity Lectures, Erice, Italy, Apr. 1969 Submitted for publication *Its* Nota Interna No. 465
(LNF-70/6) Avail: CFSTI

The tunnel effect in superconductors is investigated using the Schroedinger equation to obtain the transmission coefficient for the process. The general theory of the tunnel effect is described by a system in which one or both metals of the tunneling junction can be in the superconducting state. A Hamiltonian which includes many-body effects is derived to describe the different properties of the conducting metal. R.B.

N70-30123# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerper- und Neutronenphysik.

DETERMINATION OF THE DISLOCATION FUNCTIONS IN ALUMINUM AND COPPER FROM MEASUREMENT OF DEFECT CREATION WITH LOW TEMPERATUR ELECTRON BOMBARDMENT [BESTIMMUNG DER VERLAGERUNGSFUNKTION IN ALUMINIUM UND KUPFER AUS MESSUNGEN DER DEFEKTERZEUGUNG BEI TIEFTEMPERATURELEKTRONENBESTRAHLUNG]

Joerg Wurm Mar. 1969 96 p refs In GERMAN
(JUL-581-FN; D-82) Avail: CFSTI

In radiation experiments are found impact processes between the incoming particles and the atoms of crystals. This causes the crystal lattice energy of the crystal to transfer. If the transferred energy is greater than the threshold energy, the impacted atom, also called the primary atom, will remain shifted from its grid plate and creates between the atoms of regular grid plates a stable inter-lattice atom. In the place of the primary atom a vacancy remains. An inner-lattice atom and a vacancy together produce a Frenkel pair. The probability of energy transfer from primary atoms and secondary atoms combined with the number of Frenkel pairs in a cascade provides the basic approach to understanding the impact processes between atoms. Transl. by P.N.F.

N70-30184# Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia).
CRITICAL BEHAVIOR OF FERROELECTRIC TGS AND DEUTERATED TGS
R. Blinc, M. Burgar, and A. Levstik Feb. 1970 9 p refs
Submitted for publication
(IJS-R-577) Avail: CFSTI

The dependence of the spontaneous polarization on temperature and electric field has been measured for ferroelectric triglycine sulfate and deuterated triglycine sulfate, and the critical exponents gamma sub 3, gamma sub 4, gamma sub 7, gamma sub 9, and gamma sub 10 have been determined. The results are consistent with the prediction of the mean field for epsilon = (T sub c − T)/T sub c > or 0001.2 and E > 30 V/cm. For lower values of either epsilon or E systematic deviations seem to occur and the values of the exponents seem to deviate from the mean field theory and approach those predicted by the three dimensional Ising model. Author

N70-30240# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CRYSTAL STRUCTURES OF NB FE B AND TA FE B COMPOUNDS
Yu. B. Kuzma 15 Aug. 1969 7 p refs Transl. into ENGLISH from Dopovidi Akad. Nauk Uk. RSR, Ser. Fiz.-Tekhn. Mat. Nauki (Kiev), v. 29, no. 10, 1967 p 939 −940
(AD-700382; FTD-HT-23-1195-68) Avail: CFSTI CSCL 11/6

The crystal structures of NbFeB and TaFeB ternary compounds were determined by the x-ray diffraction method. The structure of these compounds belongs to the ZrAlNi-type Fe2P type superstructure. TAB

N70-30288# Addis Translations International, Woodside, Calif.
EFFECT OF HYDROSTATIC PRESSURE ON THE IONIC CONDUCTIVITY AND SELF-DIFFUSION IN SINGLE CRYSTALS OF AgCl AgCl CdCl2 [DEISTVIE GIDROSTATICHESKOGO DAVLENIYA NA IONNUYU PROVODIMOST I SAMODIFFUZIYU V MONOKRISTALLKH AGCLI AGCL + CDCL2]
B. G. Lure et al Aug. 1969 18 p refs Transl. into ENGLISH from Vestn. Leningr. Univ., Ser. Fiz. Khim. v. 23, no. 22, 1968 p 131 138 Prepared for UCRL
(PB-188148T; UCRL-Trans-10382) Avail: CFSTI CSCL 20L

The conductivity and self-diffusion coefficients for Ag(+) and Cd(+2) cations in AgCl single crystals (pure and doped with CdCl2) have been studied and determined for the temperature range from 200 C to 350 C the pressures being up to 7000 atm. The defect concentrations, mobilities and activation volumes have been determined. The results are discussed in terms of the Zener's continual model using the Gruneizen's approximation. The experimental data are considered to be in good agreements with the theory. Author (USGRDR)

N70-30296# Pennsylvania State Univ., University Park. Materials Research Lab.
THE ROLE OF TRAPPING PROCESSES IN SOLID STATE RADIATION DOSIMETRY Progress Report, 1969 1970
Feb. 1970 27 p refs
(Contract AT(30-1)-3409)
(NYO-3409-8) Avail: CFSTI

A study on the use of electrets for dosimetry of UV radiation is described. Preparation of the electrets is discussed, and the readout method, which includes heating and monitoring the output voltages and currents, is described. Both pyroelectric polarization and field-induced polarization are studied. Doped and undoped zinc sulfide single crystals and power samples were studied. The thermoluminescence properties of boron nitride hot-pressed powder were investigated for their possible use for X-ray dosimetry. NSA

N70-30311# General Electric Co., Schenectady, N.Y. Solid State Physics Lab.
INJECTION ELECTROLUMINESCENCE IN II-VI SEMICONDUCTING COMPOUNDS Final Report, 1 Oct. 1968 – 30 Sep. 1969
Manuel Aven, Dudley T. F. Marple, and H. Hugh Woodbury Wright-Patterson AFB, Ohio AFML Mar. 1970 104 p refs
(Contract F33615-69-C-1045)
(AD-702897; S-70-1035; AFML-TR-70-17) Avail: CFSTI CSCL 20/12

Single crystals of Cd(1-x)Mg(x)Te have been grown by a vertical zone-refining technique using material synthesized from Mg and CdTe. The crystals can be made n-type conducting with x up to 0.35. Aluminum and I introduce hydrogenic-type donor levels while In, Cl, and Br create deeper levels. Faraday effect measurements have shown that the band structure of Cd(1-x)Mg(x)Te is similar to that of other II-VI compounds, and that the electron effective mass is 0.17. The diffusivity and the activation energy for diffusion of Al in ZnSe, ZnSe(0.5)Te(0.5) and ZnTe have been determined in the temperature range of 700 degrees to 1000 degrees C. Luminescence efficiency measurements on ZnSe(x)Te(1-x) under cathode ray excitation have shown that in undoped and P-doped crystals the efficiency drops from about 2% at 77 degrees K to about 0.002% at 300 degrees K, while Al-doped crystals maintain an approximately 1% efficiency throughout this temperature range. Junction profile studies and spectral distribution measurements suggest that most of the radiative recombinations occur in a transition region between the n-type bulk of the diodes. A study of liquid epitaxial growth of ZnSe(x)Te(1-x) diodes has been initiated. Author (TAB)

N70-30321# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
UKRAINIAN JOURNAL OF PHYSICS: SELECTED ARTICLES
I. Ya. Gorodets'sii et al 16 Oct. 1969 12 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 11, no. 10, 1966 4 p
(AD-683614; FTD-HT-23-464-68) Avail: CFSTI CSCL 20/12

Contents: Recombination processes in ZnTe: Al single crystals; The charge on ions in manganese selenide. TAB

N70-30326# Stackpole Carbon Co., St. Marys, Pa.
MAGNETIC DIPOLES Final Report
Amos J. Shaler, Joseph W. Proske, and B. Thomas Shirk 9 Mar. 1970 40 p ref
(Contract N00014-69-C-0457)
(AD-702471) Avail: CFSTI CSCL 20/3

Magnetic dipoles were constructed from permanent magnet (barium ferrite) and soft iron tiles. The magnetic fields were measured in the radial and tangential direction at relatively large distances. It was found that the fields obeyed the ideal dipole law to within a few percent. The radial and tangential components of the field were proportional to the cosine and sine of the angular variation respectively. The ratio of the radial and tangential components was 2, and the magnetic field components decreased with distance as 1/(r cubed). The effect of iron to ferrite ratios upon the external fields was also noted. It was found that the external field of an all-ferrite dipole configuration increased in proportion to the volume of ferrite present. However, direct substitution of iron for ferrite caused the external field to decrease. Lengthening the dipole configuration by the addition of iron caused an increase in external field but at a rate less than the volume increment. Generally, an increase in the cross section of the dipole configuration led to a decrease in the external field. Author (TAB)

N70-30488# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerper und Neutronenphysik.

INCOHERENT SCATTERING OF SLOW NEUTRONS BY GLOBULAR MOLECULES IN A CUBIC CRYSTAL. PART 1: CALCULATION OF NEUTRON TIME-OF-FLIGHT SPECTRA. PART 2: INTERPRETATION OF SCATTERING DATA FOR ADAMANTANE

R. Stockmeyer, F. Hossfeld, and A. Axmann Apr. 1969 55 refs
(JUL-588-FN) Avail: CFSTI

The information provided by neutron scattering about the dynamics of molecular crystals is investigated by comparing the experimental results with calculations of the scattering law based on a model. The calculations include the dependence of the scattering law on momentum transfer. Time-of-flight distributions are derived from a scattering cross section, which includes rotational diffusion jumps, in a form suitable for machine calculations. The influence of multiple scattering is considered and time-of-flight spectra measured at room temperature are presented. The temperature dependence of the jump frequency is discussed and is compared with NMR results. Author

N70-30499# California Univ., Berkeley. Lawrence Radiation Lab.

STRAIN HARDENING OF LONG RANGE ORDERED SILVER MAGNESIUM SINGLE CRYSTAL

Mohamed Osama Aboel Fotoh (Ph.D. Thesis) Dec. 1969 67 p refs
(Contract W-7405-eng-48)
(UCRL-19107) Avail: CFSTI

The deformation behavior of single crystals of AgMg intermetallic compound (CsCl type structure) of various orientations in the standard stereographic triangle was investigated in tension over the range from 20K to 300K and in compression at 237.5K. The plastic behavior shows asymmetry in both the critical resolved shear stress for slip on the (112) planes and in the strain hardening. Crystals oriented near the (001) direction deform in tension by slip in the (111) direction and on well defined crystallographic (112) planes in the range from 20K to 300K, while those oriented near the (111)-(011) boundary deform in tension by slip on a system of the form (hk0) (001) in the range from 50K to 300K. Crystals oriented near the (111)-(011) boundary deform in compression by slip on the (211)(111) system. The tensile flow stress of crystals oriented near the (001) direction is found to depend strongly on temperature in the range from 20K to approximately 250K, while the tensile flow stress of crystals in orientations near the (111)-(011) boundary is relatively independent of temperature in the range from 50K to 300K. Author

N70-30522# Technische Hogeschool, Eindhoven (Netherlands).

NMR IN SOME ANTIFERROMAGNETIC HYDRATED COMPLEX Mn-2 CHLORIDES

Willem Jacob Marinus de Jonge (Ph.D. Thesis) 9 Apr. 1969 81 p refs
Avail: CFSTI

Experimental investigations are reported on some antiferromagnetic complex hydrated manganese salts, such as Cs2MnC l4.2H2O, CsMnCl 3.2H2O, and KMnC.3.2H20 with nuclear magnetic resonance. It was affirmed that in determining the type of magnetic ordering, or the magnetic space group, apart from the proton resonance data, information provided by the resonance on the ligand ion nuclei, i.e. chlorines, and cesium ion nuclei are needed. In this connection solutions of the Hamiltonian for combined Zeeman and quadrupole interactions were reviewed. A method defining the electric field gradient tensor at a high field Cs site in Cs2MnCl4.2H2O is also reported. Investigations of the Mn(+2) are included. Author

N70-30543# Western Australia Univ., Nedlands. School of Chemistry.

THE NATURE OF NON-STOICHIOMETRIC SOLIDS: STRUCTURE, TEXTURE, THERMODYNAMIC AND MAGNETIC PROPERTIES Final Scientific Report

B. G. Hyde, D. J. M. Bevan, and B. N. Figgis Jan. 1970 26 p refs
(Grant AF-AFOSR-853-67)
(AD-702473; AFOSR-70-0782TR) Avail: CFSTI CSCL 20/2

Experimental studies were carried out on the understanding of non-stoichiometry and disorder in inorganic ionic crystals. A mechanistic model for generating crystollographic shear (CS) structures is proposed. Electron diffraction/microscopy is used for examining the crystals of the various oxides of the outer transition metals. Isobaric studies of the oxides of praeseodymium, curium, and americium are undertaken. Crystallographic shear studies were made on the niobium dioxyfluoride, vanadium oxide and rutile structures. Related thermodynamic measurements are being made with a solid state galvanic cell. Magnetic susceptibility studies have been made on various rare earth oxide systems, including lanthumum, cerium, gadolinium, praeseodymium, titanium, molybdenum, thulium, and ytterbium. Structures of high- and low-temperature forms of the phase of tri-zirconoum tetra-ytterbium duodica oxide have been determined by single x-ray studies. Author (TAB)

N70-30590*# Denver Research Inst., Colo.

THE EFFECTS OF SPACE-PARTICLE BOMBARDMENT ON SOLAR-CELL MATERIALS

E. C. de Wys and K. J. Bhansali Mar. 1970 75 p refs Prepared for JPL
(Contracts NAS7-100; JPL-952533)
(NASA-CR-110408; DRI-2540) Avail: CFSTI CSCL 20L

It is intended to determine the effect of proton bombardment on silicon solar cells. The research is carried out in three separate areas of electronic measurements, electron microscopy, and X-ray topography. Experimental approach and results of the latter two techniques are discussed. The Lang method was employed for X-ray topography. Presence of numerous edge and loop dislocations was noticed before irradiation. After irradiation the edge dislocation showed up as spiral dislocations indicating that a chemical force was set up due to irradiation. The chemical force is probably related to the creation of irradiation induced vacancies. Presence of striations at right angles to the electrode due to variation in dopant concentration was noticed. Electron microscopy was done with 100 KV electrons to get maximum resolution. Type of defects present were found to be independent of fabrication method but their concentration vary. Proton irradiation caused 3 to 4 fold increase in the density of unknown type of defects. Author

N70-30597# London Univ. (England). Dept. of Theoretical Physics.

CALCULATION OF PHYSICAL PROPERTIES OF CO-OPERATIVE ASSEMBLIES Final Technical Report, May 1968 – Apr. 1969

C. Domb 1969 38 p refs
(Contract DAJA37-68-C-0860)
(AD-701168; ARDG(E)-E-1247-2) Avail: CFSTI CSCL 20/12

It is shown that there is a direct correspondence between an exponent representing the high temperature critical behavior of the Ising or Heisenberg model and a corresponding geometrical property of a self avoiding walk. For example the magnetic susceptibility corresponds to the total number of walks, the pair correlation function to the probability distribution of end points, and the gap index to the second virial coefficient of two walks. However, this provides only a first approximation to the exponent of the Ising or Heisenberg model. To proceed to the correct value, one must consider the problem of near neighbor contacts along self avoiding walks and the manner in which they are ordered. A parallel investigation has shown how the transition is effected from a normal random walk to a self avoiding walk and how the dramatic change in properties arises. The equation of state in the critical region in a non-zero magnetic field has been calculated for the speherical model with long range forces and the equation conforms to the expected pattern. An analogous formula has been put forward for the equation satisfied by the pair correlation function. New experimental data on specific heats to compare them with theoretical predictions is analyzed. Author (TAB)

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N70-29388# Little (Arthur D.), Inc., Cambridge, Mass.
THE IGNITION OF SOLID PROPELLANTS BY RADIATIVE, CONVECTIVE AND CHEMICAL HEATING Final Report
Sami Atallah, Donald S. Allan, Daniel F. Comstock, Jr., and B. Bakerjian Nov. 1969 77 p refs
(Contract F44620-67-C-0002)
(AD-701100; AFOSR-69-3091TR) Avail: CFSTI CSCL 21/9

The report presents the results of an experimental study in which aluminized and non-aluminized composite solid propellants were ignited under different environmental conditions. Ignition was achieved by radiative, convective and chemical heating. An optical system operating in two narrow wavelength bands was used to detect the onset of ignition on and near the surface of the propellant. It was found that ignition delay time was dependent on the wavelength used for detection, the method of heating, and other environmental factors. The implications of these results are discussed in relation to existing ignition theories, and recommendations are made for further study. Author (TAB)

N70-29824*# Scientific Translation Service, Santa Barbara, Calif.
ON THE USE OF HYDROGEN PEROXIDE AS OXIDIZER IN HYBRID SYSTEMS [UTILISATION DANS LE SYSTEMES HYBRIDES DE L'EAU OXYGENEE COMME COMBURANT]
M. Pugibet et al Washington NASA May 1970 38 p refs
Transl. into ENGLISH from Rech. Aerospatiale (Paris), no. 132, Sep.-Oct. 1969 p 15-31
(Contract NASw-2035)
(NASA-TT-F-13034) Avail: CFSTI CSCL 21I

The use of hydrogen peroxide as an oxidizer in hybrid propulsion systems is investigated, the ignition being assured by hypergolic reactions. The laboratory study of its hypergolic qualities shows that the metallic hydrides and borohydrides, in particular the alkaline compounds, give short ignition time-lags. The mixture 70% paratoluidine-30% potassium borohydride, tested in a microthruster in the presence of a metatoluene diamine-based fuel, gave an ignition time-lag of six millisec. A performance comparison of this same fuel in the presence of nitric acid, nitrogen peroxide and hydrogen peroxide shows higher regression rates for the latter, leading to higher characteristic mixture ratios. As a consequence, new fuels appear that are specific to this oxidizer; they contain polymers and plastic binders. To their good combustion qualities they add excellent mechanical properties. Among them, carboxyl-polybutadiene has been used as a base for studying the combustion of metals. Author

N70-29909# Little (Arthur D.), Inc., Cambridge, Mass.
FACTORS INFLUENCING IGNITION DELAY TIME OF COMPOSITE SOLID PROPELLANTS
S. Atallah, D. S. Allan, D. F. Comstock, Jr., and E. K. Bastress (Northern Res. and Engr. Corp.) 1970 13 p refs Presented at the 8th AIAA Aerospace Sci. Meeting, New York, 19-21 Jan. 1970 Prepared in cooperation with Northern Res. and Engr. Corp. *Its* AIAA Paper No. 70-121
(Contract F44620-67-C-0002)
(AD-702196; AFOSR-70-0533TR) Avail: CFSTI CSCL 21/9

Thermal events occurring on an near a propellant surface during ignition were observed simultaneously using an optical detector operating over two narrow wavelengths: 3.79 micrometers which is free of interfering CO2 and H2O thus representing radiation from the surface and 0.43 micrometers which detects the CH radical in the flame above the surface. Aluminized and non-aluminized PBAA/AP propellants were heated using an arc-imaging furnace with argon or oxygen flowing near the propellant surface at different velocities and irradiation levels. Combustion products of CO-O2-N2 mixtures of varying compositions were also used to heat the propellants convectively in a hot gas tunnel. Furthermore, the non-aluminized propellant was ignited chemically with fluorine. Differences in the ignition delay time as measured by the two detectors were observed under certain conditions. Factors affecting these differences and the magnitude of the delay time are discussed. Author (TAB)

N70-30091*# Atlantic Research Corp., Alexandria, Va. Kinetics and Combustion Group.
A STUDY OF ENERGY RELEASE IN ROCKET PROPELLANTS BY A PROJECTILE IMPACT METHOD Final Report
Andrej Macek 23 Dec. 1969 37 p refs
(Contract NAS1-8622)
(NASA-CR-66926) Avail: CFSTI CSCL 21I

The rate of energy release in solid propellants was studied by means of shock waves of known durations and known constant amplitudes. Instrumentation for a gauge allowing direct experimental determination of shock amplitude as a function of time was designed and perfected The gauge was calibrated from 3.8 to 17.4 kbar. Four granular materials and a cast composite propellant, all based on ammonium perchlorate, were tested by being exposed to square shock waves with amplitudes ranging from 7.8 to 21.4 kbar, and durations ranging from 8 to 21 microseconds. Explosion thresholds were found to depend greatly on physical and chemical characteristics of samples. An accurate quantitative analysis for the perchlorate ion was developed, based on precipitation titration with tetraphenyl arsonium chloride. Samples shocked below the explosion threshold showed only very small amounts of decomposition. It is concluded that the four most important factors for initiation and buildup of chemical reaction are density of the sample, addition of burning-rate catalysts, shock pressure, and shock duration. Author

N70-30111*# United Aircraft Corp., East Hartford, Conn. Research Labs.
ANALYTICAL STUDY OF CATALYTIC REACTORS FOR HYDRAZINE DECOMPOSITION. ONE AND TWO DIMENSIONAL STEADY-STATE PROGRAMS, COMPUTER PROGRAMS MANUAL
E. J. Smith, D. B. Smith, and A. S. Kesten Aug. 1968 145 p refs
(Contract NAS7-458)
(NASA-CR-110403; UACRL-G910461-30) Avail: CFSTI CSCL 21I

Two machine computational programs have been developed to calculate the steady-state temperature and reactant concentration distributions in typical catalyzed hydrazine decomposition reaction chambers. One program is based upon a one-dimensional model of the reactor system which describes the behavior of reactors having radially uniform injection profiles and catalyst bed configurations; the other program is based upon a two-dimensional model which permits consideration of nonuniform radial injection and catalyst bed configurations exhibiting both radial and axial nonuniformities. The one- and two-dimensional models and the computer programs developed from these models are described. The manual contains operating instructions for these programs as well as descriptions of input and output formats, including all output messages. Also included is a discussion of possible operational problems which might arise together with appropriate means for solving these problems. Author

N70-30331# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOLID ROCKET PROPELLANTS
A. I. Grigorev 21 Nov. 1969 135 p refs Transl. into ENGLISH from Tverdye'Raketnye Topliva (Moscow), 1969 p 1-115
(AD-702153; FTD-MT-24-326-69) Avail: CFSTI CSCL 21/9.2

The book is a brief survey of the works published in domestic and foreign literature on solid-propellant rockets. The book contains in accessible form the basic data about solid propellants employed abroad as powerful sources of energy in contemporary rocket technology. Described are the compositions of solid-propellants, the peculiarities of their combustion, their energy and mechanical properties and also the manufacturing technology. Author (TAB)

N70-30536*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESEARCH IN USA ON LNG AS AN AIRPLANE FUEL
Richard J. Weber [1970] 12 p To be presented at the 2d Intern. Conf. on Liquefied Gas, Paris, 19-23 Oct. 1970; sponsored by Intern. Gas Union, Intern. Inst. of Refrig., and Intern. Inst. of Gas Technol.
(NASA-TM-X-52821) Avail: CFSTI CSCL 21D

Methane, the principal constituent of liquefied natural gas, is an attractive fuel for advanced airplanes. In particular, the commercial supersonic transport derives considerable benefit from methane's improved heating value and cooling capacity compared to conventional kerosene. Potential increases of about 30 percent payload and a like reduction in direct operating cost have been predicted. However, the characteristics of liquid methane, such as its low boiling temperature and relatively low density, cause practical problems in airplane design and operation. Research is being conducted in an attempt to illuminate and solve these problems. The work includes such areas as fuel tanks and insulation, engine fuel systems, cumbustors, and turbines. Author

N70-30555# Fraunhofer-Gesellschaft Zur Forderung der Angewandten Forschung e. V., Berghausen (West Germany). Inst. fuer Chemie der Treib- und Explosivestoffe.
IGNITION OF SOLID ROCKET PROPELLANTS [ZUENDUNG VON RAKETENFESTTREIBSTOFFEN]
H. Pfoertner *In its* Examples of Appl. Res. Jun. 1969 p 28 32 refs In GERMAN (See N70-30551 15-34)
Avail: CFSTI

Some ignition mixtures were tested in order to find the best proportions. Detonation heats were determined with a calorimeter bomb, to see how far the thermal energy released during conversion influenced the ignition process. Gas chromatography was used to determine the oxygen contents of the combustion products and the flame propagation was photographed. ESRO

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N70-29315# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NEWS OF INSTITUTIONS OF HIGHER LEARNING. AERONAUTICAL ENGINEERING, VOLUME 10, NO. 3, 1967 (SELECTED ARTICLES)
E. D. Stenkin et al Oct. 1968 29 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Aviats. Tekh. (Kazan), v. 10, no. 3, 1967 p 75-88
(AD-685545; FTD-MT-24-300-68) Avail: CFSTI CSCL 21/5

Contents: The effect of incomplete mixing on the efficiency of a bypass turbojet engine; and Flame stability conditions in bypass duct combustion chambers of a bypass turbojet engine. TAB

N70-29391*# Tech Development, Inc., Dayton, Ohio.
DEVELOPMENT OF A PROPANE BURNING ANNULAR COMBUSTOR FOR USE IN A MINIATURE GAS TURBINE ENGINE
MacKenzie Burnett 22 Jul. 1969 10 p refs
(Contract NAS1-7261)
(NASA-CR-66947) Avail: CFSTI CSCL 21E

The development of a Propane Burning Annular Combustor for use in a Miniature Gas Turbine Engine for wind tunnel test programs is reported. The purpose of this program was to determine the minimum length of burner similar in concept to that developed for the hydrogen burner which could operate satisfactorily using propane as the fuel. By testing it was determined that it is not feasible to use propane as a fuel in a configuration such as was developed for hydrogen as a fuel. The differences between propane and hydrogen are considerable. Propane flame velocity at atmospheric pressure in air is less than one fifth that of hydrogen. The fuel/air mixture at which propane will burn is in the range of 2.37% to 9.5% by volume while hydrogen will burn in the much larger range of 4% to 74.2% by volume. It is concluded that the burning volume must be increased beyond realistic proportions for the small diameter combustor proposed before successful operation of a propane fueled engine could be accomplished. Author

N70-29450# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THEORY AND DESIGN OF TURBOCOMPRESSORS
K. P. Seleznev et al 21 Nov. 1969 512 p refs Transl. into ENGLISH of the book "Teoriya Raschet Turbokompressorov" Leningrad, Mashinostroyenie, 1968 p 1-406
(AD-702194; FTD-MT-24-190-69) Avail: CFSTI CSCL 21/5

Problems dealing with the theory and design of tubocompressors based on the gas-dynamic theory of cascades are examined. The thermodynamic bases of the theory of turbomachines, the basic problems of the aerodynamics of compressible gas and elements of theory of the wing are included. Problems of the flow of gas around flat, annular, circular and three-dimensional cascade designs are expounded in sufficient detail. The theory and design of a stage of a turbocompressor are examined. Author (TAB)

N70-29706*# Rocketdyne, Canoga Park, Calif. Turbomachinery Dept.
THERMODYNAMIC IMPROVEMENTS IN LIQUID HYDROGEN TURBOPUMPS Final Report, 17 Aug. 1968 - 16 Nov. 1969
W. R. Wagner, G. S. Wong, and E. B. Monteath Dec. 1969 257 p refs
(Contract NAS8-20324)
(NASA-CR-102722; R-8083) Avail: CFSTI CSCL 21H

The completed effort is described in the evaluation of thermal conditioning problems of liquid hydrogen turbopumps to enhance mixed-phase operation and to minimize engine system constraints on starts and restarts. The program consists of three interrelated tasks: (1) Reduced gravity effects on heat transfer, (2) Coated feed systems, and (3) Engine system analyses. Author

N70-29829# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DETERMINATION OF OPTIMUM CHORD OF BLADES OF STAGES WITH SHROUDLESS BLADE RINGS

K. M. Lasenko et al 17 Oct. 1969 16 p refs Transl. into ENGLISH from Energomashinostroenie (Moscow), v. 14, no. 9, 1968 p 22-24
(AD-700365; FTD-MT-24-287-69) Avail: CFSTI CSCL 21/5

Values of optimum blade chords in stages with shroudless blade rims were determined taking into account all losses of shroudless stages, whose blades are twisted according to the rule for a potential flow. The discussed method of calculating the optimum chord value satisfactorily agrees with experimental data obtained on non-twisted blades in the turbine blading. Author (TAB)

N70-29859*# Northrop Corp., Hawthorne, Calif.

DESIGN, FABRICATION, AND TEST OF A BREADBOARD HYBRID PRESSURIZATION SYSTEM Final Report

Walter F. Keller May 1970 140 p refs
(Contract NAS7-714)
(NASA-CR-110365; NOR-69-129) Avail: CFSTI CSCL 21H

Results are reported on a NASA-sponsored, JPL-managed program to design, build, and test a breadboard hybrid pressurization system. The system makes use of liquid chlorine trifluoride and solid sodium azide to generate hot nitrogen suitable for direct contact pressurization of both fuels and oxidizers of typical earth and space storable propellants. The program included a survey, analysis, and test of candidate oxidizer/fuel combinations, development of components, combustion studies, analysis of the selected combination and study of optimum hot gas temperatures, and design, fabrication and test of the breadboard system. Sodium azide was selected as the fuel on the basis of its high yield of nitrogen and separability of impurities, physical properties, and availability. Other potential compounds were rejected due to reactivity of combustion products, lack of hypergolicity, or unavailability. Testing was conducted on both shell grain and pellet bed configurations of 1-1/4 to 1-1/2 inch diameter and 1 to 8 inches in length. The final breadboard configuration was a 1-1/2 inch OD by 5/8 inch ID by 7 inch long shell grain. Author

N70-29861# TRW Systems Group, Redondo Beach, Calif.

THRUST MEASUREMENT FOR A PULSED INDUCTIVE THRUSTER

C. L. Dailey 21 Jan. 1970 5 p ref
(Contract F44620-68-C-0042)
(AD-702498; AFOSR-70-0585TR) Avail: CFSTI CSCL 21/3

There are many system advantages related to a pulsed inductive thruster. The use of a coil in place of electrodes allows the entire thruster system to be operated at atmospheric pressure during system integration and verification testing and during launch pad operations. Also, the coil automatically matches the low plasma impedance to the high impedance needed for high voltage energy storage capacitors. This eliminates the need for a pulse transformer as is required by a high-power quasi-steady MPD arc. It also eliminates the need for the bias-field magnet that is used to increase the load impedance of a low-power, steady, MPD arc. In the inductive geometry the magnetic forces eject the plasma away from the thruster so that heating and erosion are less severe than in an electrode device. The inherently short pulse duration of this thruster has two application advantages: it meets the intermittent thrust requirements for spinning satellites and a wide range of thrust control is achieved by changing valve injection pressure and repetition rate. With respect to development and reliability testing, the pulsed character is useful in that accelerated life testing is feasible. The direct measurements of thrust, reported here, were made to assess the possible usefulness of the pulsed inductive thruster. Author (TAB)

N70-29928*# TRW Systems Group, Redondo Beach, Calif.

APOLLO LUNAR MODULE DESCENT ENGINE ABLATIVE CHAMBER: INJECTOR COMPATIBILITY IMPROVEMENT STUDY Summary Report

24 Dec. 1969 8 p
(Contract NAS9-8229)
(NASA-CR-108470; TRW-11602-6040-R0-00) Avail: CFSTI CSCL 21H

The study to determine and demonstrate material and design improvements to reduce the ablative chamber erosion in the Lunar Module Descent Engine (LMDE) is summarized. Included are brief summaries of the following objectives: define and characterize the internal combustion chamber environment to which the ablative chamber is subjected; determine and evaluate improved ablative chamber materials and chamber designs; and design, fabricate, and test an improved descent engine thrust chamber. It is concluded that: (1) the effects of heat flux on LMDE throat erosion was only part of a more complex problem, including temperatures, shear forces, oxidation, melt viscosity, and thermochemical reactions occurring at the wall; and (2) significant reduction in erosion as experienced when silica fabric was replaced with quartz fabric. F.O.S.

N70-29976*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FLOX/METHANE PUMP-FED ENGINE TECHNOLOGY REVIEW

John W. Gregory [1970] 26 p refs Presented at 6th Propulsion Joint Specialist Conf., San Diego, Calif., 15-19 Jun. 1970; sponsored by AIAA
(NASA-TM-X-52796) Avail: CFSTI CSCL 21H

A comprehensive program has provided the technology groundwork for application of FLOX/methane propellants to pump-fed rocket engines. Injectors have been developed utilizing liquid oxidizer/gaseous fuel. Regeneratively cooled thrust chambers have been designed, fabricated, and tested. Altitude performance data have been obtained with high expansion ratio nozzles. Optimum turbopump drive cycles and turbomachinery arrangements have been selected. Turbomachinery and valve critical design criteria have been obtained through experimental work on bearings, seals, and shutoff valves operating in fluorine. The results of the above programs are summarized. Author

N70-30052*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPUTER AND ENGINE PERFORMANCE STUDY OF A GENERALIZED PARAMETER FUEL CONTROL FOR JET ENGINES

Kurt Seldner and Harold Gold Washington Jun. 1970 40 p refs
(NASA-TN-D-5871; E-5263) Avail: CFSTI CSCL 21H

A mathematical analysis of a generalized parameter hydraulic fuel control concept is presented. An analog computer simulation was used to establish the feasibility of the fuel-control concept for jet engine applications. The simulation of the fuel control was first operated with a simulation of the J85-13 engine and then operated as an experimental control with an actual J85-13 engine in a test cell. Results obtained from the use of the simulated fuel control with both the simulated and actual engines are presented. The operation of the control is discussed, and its performance is compared with that of the normal J85-13 control. Author

N70-30086# Aeronautical Research Labs., Melbourne (Australia).

THE GOBLIN MK 35 ENGINE: INVESTIGATION OF FLAME TUBE FATIGUE

J. E. Williams Dec. 1968 73 p refs
(ARL/ME-123) Avail: CFSTI

This investigation has shown that a high fatigue environment exists in the combustion system due to large pulsations in the compressor delivery pressure at frequencies of 2700-3050 Hz. It was shown that sections of the standard form of flame tube used have basic modes of vibration in this frequency range, and very severe resonances occur in various speed bands. The results of the combustion rig tests indicate that most of the flame tubes in service have accumulated fatigue damage throughout long operating lives, and the recent higher failure rate is probably the inevitable result of this accumulated damage. Of the various modifications tested, that which should extend flame tube life most significantly was the attachment of an extra skin layer on the flame tube head: this eliminated damaging resonances in the heat and in the primary zone wall. The work has shown the feasibility of reproduction of engine pulsating pressure conditions in a combustion rig, and has shown that flame tube testing for resonances must be done at simulated operating temperatures. Author

N70-30107*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A REVIEW OF LIFT FAN PROPULSION SYSTEMS FOR CIVIL VTOL TRANSPORTS

S. Lieblein [1970] 41 p refs Presented at 6th Propulsion Joint Specialists Conf., San Diego, Calif., 15-19 Jun. 1970; sponsored by AIAA
(NASA-TM-X-52829) Avail: CFSTI CSCL 21E

The low-pressure ratio lift fan propulsion system for intercity VTOL transports is considered. The objective is to review the requirements and problem areas involved in the lift fan propulsion system, and discuss research considerations and approaches aimed at providing the design and performance data necessary for realistic evaluation of the potential applicability of the system or use in VTOL transport aircraft. Propulsion functions and concepts for lift, cruise, transition, and attitude control and their interactions are discussed. Included is a description of various methods for driving the lift fan, and a discussion of their principal features. Major design requirements of the lift fan system are also discussed such as thrust, noise, weight, and component and system design. Factors in fan transition performance are also summarized. Desirable research efforts are identified throughout. Author

N70-30110# Naval Postgraduate School, Monterey, Calif.

THE NPS ROCKET CORER: A FIRST GENERATION ROCKET POWERED CORING TOOL

George E. Pierce and R. J. Smith 14 Jan. 1970 34 p refs
(AD-700707; NPS-58SJ700) Avail: CFSTI CSCL 8/10

A rocket motor powered corer has been designed and built. Limited tests of the rocket corer, conducted in a sand-silt-clay bottom at a depth of 100 feet off Pitas Point in Ventura County, showed promising results. It has been demonstrated that available rocket motors can be used to drive coring devices in relatively shallow water. Further tests are warranted to determine the maximum depth that rocket-powered instruments may be used. It presently appears possible that rocket motors may be used as a general source of power for varied underwater applications. Author (TAB)

N70-30254# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

TESTING OF AIRCRAFT AIR-BREATHING JET ENGINES (SELECTED CHAPTERS)

G. M. Gorbunov et al Oct. 1968 205 p refs Transl. into ENGLISH from the Russian
(AD-685492; FTD-MT-24-236-68) Avail: CFSTI CSCL 21/5

Contents: Instruments and measuring equipment for testing stations and stands; Treatment of experimental data. TAB

N70-30319# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THERMODYNAMIC AND BALLISTIC PRINCIPLES FOR THE DESIGN OF SOLID-PROPELLANT ROCKET ENGINES: SELECTED CHAPTERS

B. V. Orlov et al 14 Jan. 1970 288 p refs Transl. into ENGLISH from the book 'Termodinamicheskie i Ballisticheskie Osnovy Proektirovaniya Raketnykh Dvigatelei Na Tverdom Toplive' Moscow, Mashinostroyeniye, 1968 276 p
(AD-701998; FTD-HT-23-288-69) Avail: CFSTI CSCL 21/9

This book, on the basis of materials published in the domestic and foreign press, presents the thermogasodynamics principles of the design of engines, the engineering methods of calculating heat exchange processes, the principles of solid propellant combustion, and the calculation of the indicator curve of pressure in the engine combustion chamber. The book gives basic information on solid propellants used in solid rocket engines. Thrust regulation in solid rocket engines and the ballistic principles of solid rocket engines are examined. The book is intended for students in higher technical education institutes and for engineers-technicians specializing in solid fuel rocket engines. Author (TAB)

N70-30365# Leasco Systems and Research Corp., N.Y.

FUEL ADDITIVE ATOMIZATION IN JET ENGINE TAILPIPES Final Report, Aug. 1968 – Nov. 1969

Phillip Cole and Irwin Parmet 30 Jan. 1970 39 p refs
(Contract F19628-68-C-0376)
(AD-701067; Rept-51502; AFCRL-70-0031) Avail: CFSTI CSCL 21/5

The report includes a review of the technical literature relating to the modelling of the atomization process, an analysis of the differences between conditions studied in the reports and those found in jet exhausts, and, finally, recommendations for follow-up studies designed to modify early models as a consequence of those differences. Author (TAB)

N70-30368# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

METHOD FOR STUDY OF THERMAL FATIGUE OF MECHANICALLY LOADED ROTOR BLADES

G. N. Tretyachenko et al 7 Nov. 1969 14 p refs Transl. into ENGLISH from Tekhnol. Organ. Proizvod. (Ukrania), no. 4, 1968 p 102–104
(AD-701034; FTD-MT-24-298-69) Avail: CFSTI CSCL 21/5

A method is described for analyzing the thermal fatigue of the nozzle and working blades of gas turbine engines under conditions most nearly approximating the actual operating conditions of the blade in the turbine. The method also makes it possible to run comparative tests of blades manufactured of different materials under varying thermomechanical loading conditions and to select the optimum set if loading conditions based on an investigation of the crack-forming process and configuration change and an analysis of the temperature and stress fields of different design and materials subject to nonstationary thermal and mechanical effects. TAB

N70-30462# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France).

OBJECTIVES FOR THE PROPULSION SYSTEM OF EUROPA 3B-L120 [OBJECTIFS DU SYSTEME PROPULSIF DU L 120 PREMIER ETAGE DU LANCEUR EUROPA 3B]

la Thevenot Nov. 1969 26 p In FRENCH
(Contract ELDO-17.3.63)
(NT-89/69/SET/EP) Avail: CFSTI

Material descriptions, functional schemes, technological description of dismountable elements, and equipment specifications for the propulsion system of the Europa 3B - L 120 stage are considered. Experiments performed with the engine are briefly described. Transl. by J.M.C.

N70-30470# Svenska Flygmotor A. B., Trollhattan (Sweden).

THE SR-1 PROPULSION SYSTEM

Bjoern Ankarswaerd 1970 3 p Presented at the Brit. Interplanet.

Soc. Symp. on Sounding Rockets, Cardiff, Engl., Apr. 1970
Avail: CFSTI

The Swedish SR-1 rocket engine is a prepackaged hybrid made as an integral part of the sounding rocket. The rocket has a wide temperature range and is insensitive to shocks during handling and transport. The propulsion system is described in detail. ESRO

N70-30616# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France).
RELIABILITY OF THE L120 PROPULSION SYSTEM [FIABILITE DU SYSTEME PROPULSIF L120]
R. Crepin 19 Sep. 1969 34 p In FRENCH
(LRBA-NT-27/69-SEV/CE) Avail: CFSTI

An analysis of the failures of fuse engine is presented. A description of the engine with an analysis of constraints affecting each part is given. A comparative study is made of the reliability of groups composed of two, four, and five engines. Transl. by J.M.C.

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics; and 24 Physics, Atomic, Molecular, and Nuclear.

N70-29962*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPLANETARY ENERGETIC PARTICLE DIFFUSION COEFFICIENT DETERMINATION USING RANDOM WALK FROM SHOCK WAVES
John F. Arens Jun. 1970 31 p refs Submitted for publication
(NASA-TM-X-63942; X-646-70-226) Avail: CFSTI CSCL 03B

A shock wave passing through the solar wind can apparently reflect energetic protons to build up an enhanced intensity in front of the shock wave. Values of the diffusion coefficient in interplanetary space and the reflection efficiency of the particles can respectively be calculated from the distance the enhanced region extends in front of the shock wave and the increase in intensity from the undisturbed intensity. Values are found by fitting the data of Ogilvie and Arens (1970) and describing properties of 1 MeV protons with pitch angle approximately 90 deg scattering through approximately 20 deg. Author

N70-30120*# California Univ., Los Angeles. Plasma Physics Group.
LOW FREQUENCY INTERCHANGE INSTABILITIES OF THE RING CURRENT BELT
C. S. Liu Jan. 1969 60 p refs
(Grant NGR-05-007-116; Contract Nonr-4756(01))
(NASA-CR-103292; AD-681724; R-38) Avail: CFSTI CSCL 04A

The stability of the ring current belt against low-frequency, electrostatic perturbations is analyzed, with the effect of a finite electric field along the magnetic line of force included. We find four possible instabilities--the hydromagnetic interchange, the trapping instability, the low-frequency flute mode, and the resonant interchange; the conditions for their occurrence in the ring current belt are derived. Due to the parallel electric field associated with the instabilities, their main consequence is to precipitate charged particles into the ionosphere, leading to ring current pressure relaxation. Their possible relevance to observations is discussed. Author (TAB)

N70-30129# European Space Research and Technology Center, Noordwijk (Netherlands).
THE PHOTOELECTRON SHEATH AROUND A BODY IN INTERPLANETARY SPACE
R. J. L. Grard and J. K. E. Tunaley Jan. 1970 26 p refs
(ESRO-SN-108/ESTEC) Avail: CFSTI

Estimating the extent of the photoelectron sheath and associated electric field around a spacecraft in interplanetary space is important for the interpretation of probe measurements. In addition, the theory is relevant to predicting the sheath parameters around such bodies as the moon. In the present study, a general treatment of the photoelectron sheath in a vacuum is undertaken, typical sheath profiles are given and the effects of a tenuous ambient plasma are also discussed. Finally, an attempt is made to ascribe orders of magnitude to the physical parameters of the photoelectron sheath. Author (ESRO)

N70-30222# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
STUDY OF THE X RADIATION BETWEEN 10 AND 100 keV PRODUCED IN AND ABOVE THE ATMOSPHERE [ETUDE DU RAYONNEMENT X ENTRE 10 ET 100 KEV PRODUIT DANS L'ATMOSPHERE ET AU-DESSUS DE L'ATMOSPHERE]
Robert Rothenflug (Ph.D. Thesis—Paris Univ., 14 Nov. 1969) Apr. 1970 114 p refs In FRENCH; ENGLISH summary
(CEA-R-3979) Avail: CFSTI

To measure X-rays in this energy range a NaI(Tl) scintillator and photomultiplier, were used. They were carried by balloons to the −40 km level to detect radiation from outside the atmosphere. The atmosphere is also the center of ionizing radiation giving rise to parasitic X-rays in the air and in the materials surrounding the detector, and the latter were studied in detail. Measurements of the diffuse extraterrestrial radiation in 3 different directions showed it to be isotropic to within 20 per cent. Possible origins of the diffuse radiation are discussed. Author (ESRO)

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N70-29281# Joint Publications Research Service, Washington, D.C.
SOVIET STUDIES OF UNIVERSE
30 Mar. 1970 37 p refs Transl. into ENGLISH from Priroda (Moscow), no. 1, Jan. 1970 p 20−33, 66−69
(JPRS-50185) Avail: CFSTI

CONTENTS:

1. CONDITIONS FOR LIFE IN THE UNIVERSE V. G. Fesenkov p 1−16 refs (See N70-29282 15-30)
2. THE SEARCH FOR QUARKS Ye. L. Feynberg p 17−29 refs (See N70-29283 15-24)
3. COLOR SURVEY OF MOON AND EARTH FROM SPACE V. D. Bolshakov et al p 30−35 (See N70-29284 15-30)

N70-29282# Joint Publications Research Service, Washington, D.C.
CONDITIONS FOR LIFE IN THE UNIVERSE
V. G. Fesenkov *In its* Soviet Studies of Universe Jan. 1970 p 1−16 refs (See N70-29281 15-30)
Avail: CFSTI

The origin of organic substances and complex compounds which constitute the basis of life on earth is considered. The question is posed whether the complex compounds developed during the process of evolution of the young earth or whether they developed during the process of preterrestrial evolution of matter. The conditions for development of such compounds as amino acids, protein components, and nucleotides are discussed with respect to the different stages in the evolution of matter in the universe. R.B.

N70-29284# Joint Publications Research Service, Washington, D.C.

COLOR SURVEY OF MOON AND EARTH FROM SPACE

V. D. Bolshakov et al *In its* Soviet Studies of Universe Jan. 1970 p 30–35 (See N70-29281 15-30)

Avail: CFSTI

Color photographs of the earth and moon from the Zond 7 lunar probe are discussed. The photographic method is concluded to be superior to phototelevision in aerial surveys for compiling maps at different scales for large areas. Color photographs are used to determine the configuration and size of planets, for refinement of exposure meter computations, determination of data from chemical-photographic processing, albedo of the moon and earth, and coefficients of the spectral reflectivity of the continents, oceans, seas, forested areas, and lunar formations. R.B.

N70-29319# Joint Publications Research Service, Washington, D.C.

ASTRONOMY

In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 225 26 Mar. 1970 p 1–7 refs (See N70-29318 15-34)

Avail: CFSTI

The development of a telescope with a 1.5 m diameter mirror for the Estonian observatory is reported. Abstracts of scientific articles are presented. Included are: spectrophotometric studies of Venus, and the Jovial Red Spot; meteor bodies, and meteor streams; and the halo phenomena in the Martian atmosphere. F.O.S.

N70-29328# Joint Publications Research Service, Washington, D.C.

ASTRONOMY

In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 223 27 Feb. 1970 p 1–6 refs (See N70-29327 15-34)

Avail: CFSTI

The progress of the astrophysical observatory construction in the Caucasus mountains is summarized, along with a book review concerning Jupiter's atmosphere. Lunar volcanic activity is verified and discussed involving luminescence of escaping gas from the moon's interior. Abstracts of other astronomical literature are also included. J.A.M.

N70-29337# Joint Publications Research Service, Washington, D.C.

ASTRONOMY

In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 222 16 Feb. 1970 p 1–10 refs (See N70-29336 15-34)

Avail: CFSTI

Abstracted data concerning planetary weather conditions, astrophysics, statistics of quasars, meteor flares, and the density of matter in cometary atmospheres are presented. The effect of ellipticity of solar orbit on motion of planetary satellites and the indirect effect of solar attraction on motion near triangular libration points of the earth-moon system are summarized. J.M.C.

N70-29393*# TRW Systems Group, Houston, Tex.

A PSEUDOSTATE THEORY FOR THE APPROXIMATION OF THREE-BODY TRAJECTORIES

S. W. Wilson, Jr. [1969] 50 p refs

(Contract NAS9-8166; Proj. Apollo)

(NASA-CR-101862; TRW-1176-H304-R0-00; TRW-69-FMT-765)

Avail: CFSTI CSCL 22C

An analytical derivation and an empirical validation of a pseudostate theory for the approximation of three-body trajectories is presented. Application of the theory yields "overlapped conic" trajectories characterized by error magnitudes only about 20 percent as great (for typical lunar missions) as patched conic trajectory errors. Execution time and adaptability to split boundary value problems are generally comparable, and in some cases the overlapped conic technique is superior to the patched conic method in both respects. Only minor changes in coding should be required to incorporate the overlapped conic simulation into existing patched conic computer programs. Author

N70-29433# Joint Publications Research Service, Washington, D.C.

ASTRONOMY

In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 224 11 Mar. 1970 p 1–7 refs (See N70-29432 15-34)

Avail: CFSTI

Seven abstracts are given on the following topics: textbook on lunar physics, astrophysical research; problems in space physics; meteorological studies on the lunar surace; numerical analysis of hypothetical comet orbits from eruptions on Jovian surface; numerical analysis of the distribution of orbits of hypothetical Jovian comets, and solar corpuscular streams effect on meteor particles in interplanetary medium. E.C.

N70-29440# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

UTILIZATION OF THE LINEARIZED EQUATIONS FOR THE STUDY OF OPTIMAL SPACE TRAJECTORIES; APPLICATION TO THE SINGULAR CHATTERING SOLUTIONS [UTILISATION DES EQUATIONS AUX VARIATIONS DANS L'ETUDE DES TRAJECTOIRES SPATIALES OPTIMALES; APPLICATION AUX SOLUTIONS SINGULIERES RETICENTES]

Jean-Pierre Marec 1969 38 p refs In FRENCH; ENGLISH summary Presented at 3rd Colloq. on Optimization, Nice, 5 Jul. 1969

(ONERA-TP-729) Avail: CFSTI

The optimal transfers in a central gravitational field are studied using the formulas for the perturbations of the osculating Keplerian orbit elements and the corresponding linearized equations, which are preferred to the adjoint equations. This method permits writing the equations in a suitable vector form, outlines the first integrals, and helps in the geometrical interpretation of the results. It is applied to the study of the singular chattering solutions in the case of unlimited time. Author

N70-29476# Analytical Mechanics Associates, Inc., Jericho, N.Y.

OPTIMAL SPACE TRAJECTORIES Final Report

Theodore N. Edelbaum Dec. 1969 165 p refs

(Contract AF 49(638)-1648)

(AD-701112; AFOSR-70-0299TR) Avail: CFSTI CSCL 22/3

The proliferation of papers published on various aspects of optimum space trajectories has made it desirable to produce a unified treatment of this subject that contains the major results of these papers. This monograph on optimal space trajectories is addressed to this goal. It includes chapters on space propulsion systems, the maximum principle, general theory of optimum rocket trajectories, trajectory optimization in field free space, trajectory optimization in an inverse square-field, linearized power-limited transfer in the vicinity of an elliptic orbit, optimum power-limited orbit transfer in strong gravity fields, linearized impulsive transfer in the vicinity of a circular orbit, optimum impulse transfer in an inverse square field, singular arcs, interplanetary trajectories, and combination propulsion. Author (TAB)

N70-29497# Stanford Univ., Calif. Inst. for Plasma Research.

A MODEL OF EXTRAGALACTIC RADIO SOURCES

David M. Mills and Peter A. Sturrock Nov. 1969 24 p

(Contracts N00014-67-A-0112-0006; F44620-69-C-0008)
(AD-701073; SU-IPR-347) Avail: CFSTI CSCL 3/2

A model is proposed for the compact bright radio sources ejected from radio galaxies and quasars. It is shown that the model gives good agreement with the characteristic brightness distribution and polarization behavior of these sources. Specific application is made to the radio source Cygnus A. Author (TAB)

N70-29516# Minnesota Univ., Minneapolis.
PROPER MOTION SURVEY WITH THE FORTY-EIGHT INCH SCHMIDT TELESCOPE. THE ZONE +70 TO +75
Willem J. Luyten 15 Jan. 1970 146 p
(Contract Nonr-5060(00); Grant NSF GP-8082)
(AD-701323) Avail: CFSTI CSCL 3/3

In continuation of the General Catalogue of Proper Motions in the North Polar Cap-the area north of declination +75 - data are here given for the proper motions of 7041 stars with declinations between +70 and +75 (1950). These were found and measured on 22 pairs of plates of the National Geographic Society - Palomar Observatory Survey, all centered at declination +72 (1855). The old plates were all taken between 1950 and 1955, the new plates between 1963 and 1967, resulting in an average interval of 12.2 years. Pertinent data for these plates are given in Table I. Author (TAB)

N70-29653*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
THE THERMAL STRUCTURE OF THE JOVIAN ATMOSPHERE
Joseph S. Hogan, S. I. Rasool, and Therese Encrenaz [1969] 27 p refs
(NASA-TM-X-62954) Avail: CFSTI CSCL 03B

Thermal structure calculations have been carried out for the atmosphere of Jupiter above the level of the dense clouds, for boundary conditions suggested by recent observations. The resulting models are characterized by an extensive region of dynamical control above the cloud level, and a thermal inversion in the mesosphere, produced by absorption of solar infrared energy in the 3020/sq cm band of methane. The infrared and microwave spectra corresponding to the computed thermal models are found to be in generally good agreement with observed infrared and microwave brightness temperatures of Jupiter. The effective temperatures of all of the thermal models are higher than the solar equilibrium value, and, thus, an internal heat source on Jupiter is suggested. Author

N70-29725*# Tectran Corp., Glen Burnie, Md.
COSMOGENETIC ISOTOPES AND THE COSMIC AGE OF METEORITES [KOSMOGENNYE IZOTOPY I KOSMICHESKIY VOZRAST METEORITOV]
A. K. Lavrukhina Washington NASA May 1970 20 p refs Transl. into ENGLISH from Fiz. Planet. Tr. Astrofiz. Inst., Akad. Nauk Kaz. SSR (Alma-Ata), v. 9, 1967 p 127–138
(Contract NASw-2037)
(NASA-TT-F-12918) Avail: CFSTI CSCL 03B

The determination of the cosmic ages of meteorites is investigated with reference to cosmogenetic isotope content. Most iron meteorites have a cosmic age of 300 to 700 million years, while the age of stony meteorites seldom exceeds 100 million years, and some stones are less than 20 million years old. Author

N70-29758*# Techtran Corp., Glen Burnie, Md.
GENETIC REGULARITIES OF THE CHEMICAL COMPOSITION AND CERTAIN CHARACTERISTICS OF THE STRUCTURE AND ORIGIN OF METEORITES [GENETICHESKIE ZAKONOMERNOSTI KHIMICHESKOGO SOSTAVA, NEKOTORYE OSOBENNOSTI STRUKTURY I PROISKHOZHDENIE METEORITOV]
A. A. Yavnel Washington NASA May 1970 16 p refs Transl. into ENGLISH from Fiz. Planet. Tr. Astrofiz. Inst., Akad. Nauk Kaz. SSR (Alma-Ata), v. 9, 1967 p 139–150
(Contract NASw-2037)
(NASA-TT-F-12919) Avail: CFSTI CSCL 03B

The results of an analysis of the chemical composition of meteorites are discussed. Regularities are shown to exist which are reflected in the relationship of the percentage of the metal in the meteorite to the percentage of nickel in the metal when the data are analyzed for the types of meteorites, including achondrites, chrondrites, mesosiderites, pallasites and siderites. Conclusions are reached that meteorite material was differentiated by chemical composition during various evolutionary stages and that meteorites were formed from small bodies in which the primary structural features were established. Author

N70-29781*# Lockheed Electronics Co., Houston, Tex.
OPERATION LION: REPORT FOR NETWORK ALERT DURING APOLLO 12
Louis E. Schneider 6 Jan. 1970 10 p
(Contract NAS9-5191)
(NASA-CR-108477) Avail: CFSTI CSCL 03B

The transcript of communications between the command center and the Apollo 12 command module on the Lunar International Observers Network during an earth-based sighting of activity in the lunar crater Alphonsus, is presented. A tabulation of transient events during Apollo missions 8 through 12 is included. F.O.S.

N70-29867*# National Aeronautics and Space Administration, Washington, D.C.
COSMIC RAYS AND THEIR INTERACTIONS
V. S. Murzin et al Jun. 1970 333 p refs Transl. into ENGLISH of the publ. "Kosmicheskiye Luchi i Ikh Vzaimodeystviye" Moscow, Atom Press, 1968
(NASA-TT-F-594) Avail: CFSTI CSCL 04A

The experimental material on the nuclear interactions between particles of cosmic radiation is discussed. An analysis is made of the characteristics of the elementary nuclear interaction process in the energy range from 10 to 100,000 GeV and of the methodology of experiments on cosmic rays. Considerable attention is given to an examination of the reliability of experimental results. The cross section of the interaction of nuclear-active particles and the multiplicity, nature, and energetic and angular characteristics of secondary particles are considered. The data were obtained either by direct registration of the nuclear interactions of particles or by the study of the secondary phenomena created by particles of super-high energy in the atmosphere. A comparison is made between the characteristics obtained experimentally and theoretical models. Author

N70-29876*# Lockheed Electronics Co., Houston, Tex. Lunar and Earth Sciences Div.
OPERATION LION: REPORT FOR PERIOD OF THE FLIGHT OF APOLLO 11
Barbara M. Middlehurst and Norman C. Allen 8 Sep. 1969 26 p refs
(Contract NAS9-5191)
(NASA-CR-108476; LEC/HASD-645D.21.043) Avail: CFSTI CSCL 03A

The operational procedures of the Lunar International Observers Network are outlined, and selections from the astronauts' reports are presented. Excerpts are given from the transcription of the line tape and from the debriefing on the earthshine seen on the crater Aristarchus. Earth-based observations of activity on Aristarchus and Theophilus, and moonquakes registered by the Tranquillity seismometer are described. It is pointed out that during the flight of Apollo 11, correlations were made of the sightings of a transient lunar event from ground and from space, and also of sightings with considerable similarity in detail and timed within seconds of each other. N.E.N.

N70-29878*# Techtran Corp., Glen Burnie, Md.
THE AGE OF THE EARTH, OF HEAVY ELEMENTS, AND OF METEORITES [VOZRAST ZEMLI, TASHCHELYKH ELEMENTOV I METEORITOV]
V. I. Baranov Washington NASA May 1970 12 p refs Transl. into ENGLISH from Tr. Astrofizicheskogo Inst. Akad. Nauk Kazakh SSR (Alma-Ata), v. 9, 1967 p 121–126
(Contract NASw-2037)
(NASA-TT-F-12917) Avail: CFSTI CSCL 03B

Currently accepted estimates of the absolute age of the earth, of meteorites, and of heavy elements are discussed. The methods by which these estimates were obtained are discussed, including the assumptions underlying various age estimates. The current estimate for the age of the earth is 5 billion years which is supported by available experimental data. Author

N70-29901# Indiana Univ., Bloomington. Dept. of Chemistry.
SPECTROMETRIC STUDIES OF FAST REACTIONS IN CHEMICALLY ACTIVE SYSTEMS Final Report
Edward J. Bair 28 Feb. 1970 9 p refs
(Contract AF 49(638)-1703)
(AD-702531; AFOSR-70-0743TR) Avail: CFSTI CSCL 4/1

The report briefly summarizes research concerning the chemical compositon and stability of planetary atmospheres - primarily oxygenic atmospheres such as that of the earth, but potentially equally important in other atmospheres such as that of Venus. The atmosphere is a massive hydrodynamic system driven by photochemical energy sources. Light absorbing compounds, such as ozone, have a lamillar distribution which stems directly from the detailed mechanism of the photochemical reactions. A reliable model of this chemical distribution as a steady state photochemical system requires a self consistent theoretical and phenomenological understanding of all of the rate parameters of the individual processes which occur. Gas phase reactions of systems containing oxygen are complicated in a fundamental way by the formation of molecules and atoms in long lived electronic excited states. Author (TAB)

N70-29960*# Techtran Corp., Glen Burnie, Md.
THE CONTINUOUS SPECTRA OF THE SATELLITES OF JUPITER [NEPRERYVIYE SPEKTRY SPUTNIKOV YUPITERA]
N. V. Priboyeva Washington NASA May 1970 5 p refs Transl. into ENGLISH from Tr. Astroficheskogo Inst., Akad. Nauk Kaz. SSR (Alma-Ata), v. 9, 1967 p 94–96
(NASw-2037)
(NASA-TT-F-12912) Avail: CFSTI CSCL 03B

The continuous spectra of the Gallilean satellites of Jupiter were observed on January 4–5, 1965. Photographs were obtained using the beta Arietis as a reference star. Curves of the spectral intensities of Io, Europa, Callisto and Ganymede referred to the reference star are given. Author

N70-29965*# California Univ., Berkeley. Space Sciences Lab.
ELECTRIC FIELDS FROM A HORIZONTAL ELECTRIC DIPOLE SITUATED ABOVE A LAYERED LUNAR HALF-SPACE Final Report
A. Dey, H. F. Morrison, and S. H. Ward Mar. 1970 60 p refs *Its* Space Sci. Lab. Ser. 11, Issue 21
(Contract NAS2-5078)
(NASA-CR-73456) Avail: CFSTI CSCL 03B

A complete solution of the boundary value problem of a horizontal electric dipole situated above a stratified half-space is outlined. For the large elevation of the dipole (100 Km), as envisaged in a lunar orbital experiment, the secondary fields are computed using the method of steepest descent. For a receiver in line with the transmitter and located 100 Km above the lunar surface, the amplitudes of the electric fields, as well as the reflection coefficients at the lunar surface, are evaluated. The reflection coefficients computed upon assumption of an incident infinite plane wave are shown to be valid for frequencies above 10,000 Hz. The amplitudes of the secondary fields over a number of planar models of the lunar interior, show a resolution of up to 6 db, for the two-, four- and five-layered structures considered. As with the plane wave approximation, the dipolar reflection coefficients promise to be quite diagnostic in the detection of layering as well as in the detection of the presence of water or permafrost at shallow depths beneath the lunar surface. Author

N70-29966*# Techtran Corp., Glen Burnie, Md.
SPECTRAL OBSERVATIONS OF THE GALLILEAN SATELLITES OF JUPITER [SPEKTRAL'NYE NABLYUDENIYA GALILEEVSKIKH SPUTNIKOV YUPITERA]
A. A. Kalinyak Washington NASA May 1970 2 p ref Transl. into ENGLISH from Tr. Astrofizicheskogo Inst. Akad. Nauk Kazakh SSR (Alma-Ata), v. 9, 1967 p 97
(Contract NASw-2037)
(NASA-TT-F-12913) Avail: CFSTI CSCL 03B

Spectrograms of the Gallilean satellites 1, 2, and 3 obtained in 1963 reveal absorption lines which are not present in the solar spectrum and which may indicate the presence of gaseous clouds near the Jovian satellites. Author

N70-30006*# Techtran Corp., Glen Burnie, Md.
THE RESULTS OF PHOTOGRAPHIC PHOTOMETRY OF JUPITER [REZULTATY FOTOGRAFICHESKOY FOTOMETRII YUPITERA]
Yu. V. Aleksandrov Washington NASA May 1970 13 p refs Transl. into ENGLISH from Tr. Akad. Nauk Kazakhsk. SSR, Astrofiz. Inst. (Alma-Ata), v. 9, 1967 p 30–37
(Contract NASw-2037)
(NASA-TT-F-12903) Avail: CFSTI CSCL 03B

The optical parameters of the visible surface of Jupiter were studied through photographic photometry measurements made between 1933 and 1959. A system of equations is derived to determine the optical parameters of the atmosphere and the surface of the planet by observing the smallest values of the phase angle. The method is based on an approximation of the observed and theoretical distributions of the brightness of the planetary disk. Author

N70-30007*# Techtran Corp., Glen Burnie, Md.
CERTAIN PROPERTIES OF THE ATMOSPHERE OF JUPITER ACCORDING TO SPECTROPHOTOMETRIC OBSERVATIONS [O NEKOTORYKH SVOYSTVAKH ATMOSFERY YUPITERA PO SPEKTROFOTOMETRICHESKIM NABLYUDENIYAM]
L. S. Galkin Washington NASA May 1970 8 p ref Transl. into ENGLISH from Tr. Akad. Nauk Kazakhsk. SSR, Astrofiz. Inst. (Alma-Ata), v. 9, 1967 p 42–46
(Contract NASw-2037)
(NASA-TT-F-12905) Avail: CFSTI CSCL 03B

The results of spectrophotometric observations of Jupiter in 1962 and 1963 are discussed. Measurements were made in the 4350 to 3400 A band to determine variations in the width of the spectra of Jupiter. Measurements were made at both the North and South Poles and are presented in tabular form. Author

N70-30008*# Techtran Corp., Glen Burnie, Md.
BASIC RESULTS OF AN ANALYSIS OF OBSERVATIONS OF THE SURFACE OF JUPITER FROM 1962 TO 1965 [OSNOVIYE REZULTATY ANALIZA NABLYUDENIY POVERKHNOSTI YUPITERA V 1962–1965]
S. K. Vsekhsvyatskiy Washington NASA May 1970 11 p Transl. into ENGLISH from Tr. Akad. Nauk Kazakhsk. SSR, Astrofiz. Inst. (ALMA-ATA), v. 9, 1967 p 22–29
(Contract NASw-2037)
(NASA-TT-F-12902) Avail: CFSTI CSCL 03B

The results of visual and photographic observations of the activity of Jupiter from 1962 to 1965 are analyzed. The albedo of the equatorial belt was found to equal 0.06 which indicates that volcanic ash is present. Author

N70-30021# Defence Research Board, Ottawa (Ontario). Defence Scientific Information Service.

SUBTERRANEAN WATER ON THE PLANET MARS. THE EXISTENCE OF WATER ON THE MOON

G. N. Katterfel'd et al May 1970 11 p refs Transl. into ENGLISH from Izv. Vses. Geogr. Obshch., v. 100, 100, no. 2, 3, 1968, 1969 p 123 125, 260 264
Avail: CFSTI

The possibility of water on Mars and the Moon is briefly discussed. The north-south temperature distribution and seasonal variations on Mars are given, and the most favorable landing places for a manned flight with respect to water supply are identified. Theories about the existence of a hydrosphere and a dense atmosphere on the Moon millions of years ago are mentioned, and evidence from reflected radar data for a permafrost zone at a depth of 30 m is reported. It is felt that there is water in liquid form beneath the permafrost, and drilling in the warmest localities of the lunar surfaces could produce water. The possibility of water storage in lunar domes, highlands, and mare ridges is also described, and the terrestrial effects on lunal lunar tides is considered. N.E.N.

N70-30031*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A GLOSSARY OF TERMS RELATED TO CRATERING, SHOCK METAMORPHISM, AND LUNAR GEOLOGY

Bevan M. French and Paul D. Lowman, Jr. Apr. 1970 27 p refs Submitted for publication
(NASA-TM-X-63939; X-644-70-149) Avail: CFSTI CSCL 03B

A glossary of terms which have acquired new meanings as a result of cratering and petrographic effects of shock metamorphism was compiled. J.M.C.

N70-30035*# Lockheed Electronics Co., Houston, Tex.

LUNAR INTERNATIONAL OBSERVERS NETWORK OPERATION DURING THE APOLLO 10 MISSION

Louis E. Schneider and Barbara M. Middlehurst 27 Jun. 1969 19 p refs
(Contract NAS9-5191)
(NASA-CR-108475) Avail: CFSTI CSCL 03A

The Lunar International Observer Network (LION) to observe transient lunar phenomena is an extension of a volunteer program for observation of the moon during Apollo 8. The program objectives consist of determining whether ground observations of lunar events can be confirmed by crew members of Apollo spacecraft during lunar orbit, and to obtain further evidence that may help determine the cause of lunar events. Operational procedures of the organization are described along with observational activity during the flight of Apollo 10. In addition, a table of nineteen positive reports of transient events during the Apollo 10 mission is presented, indicating the lunar feature, type of event, and time of occurrence. D.L.G.

N70-30037*# Techtran Corp., Glen Burnie, Md.

MOTION OF AN ARTIFICIAL SATELLITE IN AN ECCENTRIC GRAVITATION FIELD

V. G. Demin Washington NASA May 1970 333 p refs Transl. into ENGLISH of the book "Dvizheniye Iskusstvennogo Sputnika v Netsentralnom Pole Tyagoteniya" Moscow, Nauka Press, 1968
(Contract NASw-1695)
(NASA-TT-F-579) Avail: CFSTI CSCL 22C

Methods for constructing the intermediate orbits of a satellite of an axisymmetrical planet are presented. Basic attention is directed to the problem of two immobile centers and to its modifications which may be relevant to the science of celestial ballistics. We present a classification of the forms of motion encountered in this problem, and make a detailed study of the most important class of satellite trajectories. Working formulas suitable for the needs of long-range prediction of the motion of artificial satellites are given. A partial case of the three-body problem, and also certain model problems of celestial ballistics, are considered. The qualitative properties of motion (stability, periodicity and near-periodicity) are approached mainly by the classical methods of H. Poincare and A. M. Lyapunov. Author

N70-30046*# Techtran Corp., Glen Burnie, Md.

EXPERIENCE GAINED FROM PHOTOMETRIC STUDIES OF THE ATMOSPHERIC ACTIVITY OF JUPITER IN 1964-1965 [ORBIT FOTOMETRICHESKOGO ISSLEDOVANIYA ATMOSFERIYOY AKTIVNOSTI YUPITERA V 1964-1965]

A. N. Aksenov et al Washington NASA May 1970 22 p refs Transl. into ENGLISH from Fiz. Planet. Tr. Astrofiz. Inst. Akad. Nauk Kaz. SSR (Alma-Ata), v. 9, 1967 p 7-21
(Contract NASw-1695)
(NASA-TT-F-12901) Avail: CFSTI CSCL 03B

Regular observations of Jupiter were made in 1964 and 1965 in order to study short-term changes in Jovian atmospheric activity. The photometric activity factors of the northern and southern hemispheres of the planet are analyzed with respect to periodicity, amplitude, and significance for additional investigation. Author

N70-30073*# Techtran Corp., Glen Burnie, Md.

THE DISTRIBUTION OF THE MOLECULAR ABSORPTION OF METHANE OVER THE JOVIAN DISK IN THE NEAR INFRARED (0.7 1.0 MICRON) [RASPREDELENIE MOLEKULYARNOGO POGLOSHCHENIYA METANA NA DISKE YUPITERA V BLIZHNEY INFRAKRASNOY]

V. G. Teifel Washington NASA May 1970 29 p refs Transl. into ENGLISH from Tr. Akad. Nauk Kazakhsk. SSR, Astrofiz. Inst. (Alma-Ata), v. 9, 1967 p 63 82
(Contract NASw-1695)
(NASA-TT-F-12910) Avail: CFSTI CSCL 03B

Methane absorption bands in the near infrared region of the Jovian spectrum were observed. Methane absorption does not increase toward the limbs of the disk, but shows a slight increase in the transition from the equator toward the poles. Possible interpretations of these features and their effects on various models of the Jovian atmosphere are examined. Author

N70-30074*# Techtran Corp., Glen Burnie, Md.

COMPARISON OF THE ABSORPTION DISTRIBUTION IN THE CH4 BAND AT 6190 A ON THE DISKS OF JUPITER AND SATURN [SRAVNENIE RASPREDELENIYA POGLOSHCHENIYA V POLOSE CH4 6190 A NA DISKAKH YUPITERA I SATURNA]

V. G. Teifel' Washington NASA May 1970 8 p refs Transl. into ENGLISH from Tr. Akad. Nauk Kazakhsk. SSR, Astrofiz. Inst. (Alma-Ata), v. 9, 1967 p 59 62
(Contract NASw-2037)
(NASA-TT-F-12909) Avail: CFSTI CSCL 03B

Preliminary results are given involving an investigation of molecular absorption distribution on the disks of Jupiter and Saturn, obtained in 1964 with a 70 cm telescope. The spectrograms of Jupiter and Saturn are examined and the relative intensity in the CH4 band at 6190 A is given for the central meridians of both planets. Author

N70-30088*# Techtran Corp., Glen Burnie, Md.

THE EVOLUTION AND PHYSICAL PROPERTIES OF THE EARTH AND PLANETS AS A CONSEQUENCE OF THEIR CHARACTERISTICS OF THEIR ORIGIN [EVOLYUTSIYA I FIZICHESKIE SVOYSTUA ZEMLI I PLANET KAK SLEDSTVIE

OSOBENNOSTEY IKH PROYISKHOZHENIYA]
V. G. Fesenkov Washington NASA May 1970 20 p refs Transl. into ENGLISH from Tr. Astrofizicheskogo Inst. Akad. Nauk Kazakh SSR (Alma-Ata), v. 9. 1967 p 109 120
(Contract NASw-2037)
(NASA-TT-F-12916) Avail: CFSTI CSCL 03B

Various theories concerning the origin and evolution of the Earth and other planets are discussed. Recent developments show that the Sun and its planets were formed during a relatively fast process involving the formation of heavy elements in the presence of a nearby supernova outburst. Evolutionary theories are proposed to explain the differences in conditions now on the Earth and Venus. The primary cause of the different evolutionary patterns of these planets is due to the fact that the particles which formed Venus were in motion along circular orbits while the Earth was produced by particles which initially moved in elongated orbit. Author

N70-30106*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE NATURE OF THE MOON'S SURFACE: EVIDENCE FROM SHOCK METAMORPHISM IN APOLLO 11 AND 12 SAMPLES
Nicholas M. Short Jun. 1970 41 p refs
(NASA-TM-X-63940; X-652-70-191) Avail: CFSTI CSCL 03B

Evidence of shock effects resulting from impact-induced pressures (hundreds of kilobars range) and temperatures occurs in varying abundance in the lunar soil and microbreccias collected around the Apollo 11 site. The three Apollo 12 samples thus far examined show less diversity of shock effects and the average intensity of shock damage is reduced. Planar features were not found and the number of glass spherules per unit volume has apparently decreased. These observations suggest that the regolith at the 12 site is younger and thus has been subjected to fewer impacts, which also accounts for its lesser thickness compared with the 11 site. Implications of shock metamorphism in these lunar materials relative to the origin of the Moon's circular structures, the regolith on the maria, and the microbreccias respectively are considered mainly from the viewpoint of Apollo 11 data. Author

N70-30151*# National Aeronautics and Space Administration, Washington, D.C.
INFLUENCE OF ATMOSPHERIC DISPERSION ON THE RESULTS OF SPECTRAL AND PHOTOGRAPHIC OBSERVATIONS OF PLANETS [O VLIYANII ATMOSPHERNOY DISPERSII NA REZUL'TATY SPEKTRAL'NYKH I FOTOGRAFICHESKIKH NABLYUDENIY PLANET]
V. G. Teifel May 1970 10 p refs Transl. into ENGLISH from Tr. Astrofizicheskogo Inst. Akad. Nauk Kazakh SSR (Alma-Ata), v. 9, 1967 p 98 103
(NASA-TT-F-12914) Avail: CFSTI CSCL 03B

The distorting effect of atmospheric dispersion on the results of stellar and planetary spectrophotometry and photographic visual observations of planets is shown. The results of elementary calculations of effects associated with atmospheric dispersion are presented to obtain reliable results. Author

N70-30152*# National Aeronautics and Space Administration, Washington, D.C.
CONCERNING SPECTROPHOTOMETRIC STAR REFERENCES DURING PLANETARY OBSERVATIONS [O SPEKTROFOTOMETRICHKIKH PRIVYAZKAKH K ZVEZDAM PRI NABLYUDENIYAKH PLANET]
N. D. Kalinekov May 1970 4 p Transl. into ENGLISH from Tr. Astrofizicheskogo Inst. Akad. Nauk Kazakh SSR (Alma-Ata), v. 9, 1967 p 104-105
(NASA-TT-F-12915) Avail: CFSTI CSCL 03B

The method commonly used to eliminate varying atmospheric transparency on the results of planetary observations is criticized. The method is based on photographing the spectrum or direct image of a star. Author

N70-30190*# Lockheed Electronics Co., Houston, Tex.
THE LION PROGRAM Interim Report
Louis E. Schneider 6 Jan. 1970 23 p refs
(Contract NAS9-5191)
(NASA-CR-108478) Avail: CFSTI CSCL 03B

The Lunar International Observer Network (LION) program is reviewed. A brief history of transient lunar phenomena, and the development of observation programs are presented including Argus, Astronet, Alpo, and LION. The responsibility of LION is to establish and maintain a reporting network for observers around the world with emphasis on periods of Apollo flights. The statistics show that approximately 46% of reported events are in or near Aristarchus. A list of LION observers is included. F.O.S.

N70-30223# Defence Research Board, Ottawa (Ontario). Defence Scientific Information Service.
CONCERNING SOME PROPERTIES OF DUST IN SPACE
V. I. Krasovski May 1970 5 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 89, no. 5, 1953 p 805-808
(T-513-R) Avail: CFSTI

The properties of cosmic dust are discussed in terms of the electric charges. It is shown that because of the greater mobility of negative electrons as compared with positive ions, dust particles in an ionized gas in the absence of light become negatively charged, and in regions of high density radiation, dust particles have a positive charge due to photoelectric emissions. It is concluded that: (1) Charged space-dust particles have an effective cross section greater than their gas-kinetic (geometric) cross section for collision with clouds of ionized gas. (2) It is difficult for the interstellar ionized gas to condense onto positively charged dust particles in the neighborhood of stars. Condensation proceeds more effectively in regions of space with low density of ultraviolet radiation. (3) Condensation of neutral interstellar gas is possible on particles of both positive and negative potential. F.O.S.

N70-30277# Liege Univ. (Belgium). Inst. d'Astrophysique.
HIGH-RESOLUTION STUDY OF UV SPECTRA OF HOT STARS BETWEEN 912 AND 3100 A [ETUDE A HAUTE RESOLUTION DES SPECTRES ULTRAVIOLETS DES ETOILES CHAUDES ENTRE 912 ET 3100 A]
C. Jamar Paris ESRO May 1969 33 p refs In FRENCH; ENGLISH summary
(ESRO-SN-101) Avail: CFSTI

The experiment proposed is devoted to the study of UV spectra from celestial bodies. The system described is designed to yield maximum resolving power for minimum pointing-and-stabilization constraints. A mean resolution of 0.8 A is achieved with a pointing accuracy of + or - 15 arc seconds. The experiment is designed to allow spectra of B stars having magnitude m sub v = 7 to be recorded with 1% precision. A highly eccentric orbit is recommended. Author (ESRO)

N70-30291# Air Force Cambridge Research Labs., Bedford, Mass. Space Physics Lab.
GEOPHYSICS AND SPACE DATA BULLETIN, VOLUME 6, NO. 3, THIRD QUARTER 1969
Anne L. Carrigan, ed. 1969 218 p refs
(AD-701387) Avail: CFSTI CSCL 3/2

Contents: Total field intensity magnetometer; Cosmic ray neutron intensity monitor; Extremely low frequency noise; Riometer; Solar optical patrol observations; Solar radio emission; Vertical incidence ionospheric soundings. TAB

N70-30458# Liege Univ. (Belgium). Inst. d'Astrophysique.
PRELIMINARY REPORT ON THE R-86 EXPERIMENTS OF THE ARTIFICIAL COMETS' SERIES [RAPPORT

PRELIMINAIRE CONCERNANT LES EXPERIENCES R-85 DE LA SERIE 'COMETES ARTIFICIELLES']
B. Rosen Paris ESRO Jan. 1968 27 p refs In FRENCH; ENGLISH summary
(ESRO-SN-70) Avail: CFSTI

The ESRO R-85 rocket experiments forming part of the 'artificial comets' program comprised the high altitude ejection of charges of ammonia and the study of their luminosity under the influence of solar radiation. The observation stations and scientific equipment are described and the data are listed. The experimental results are discussed with emphasis on a possible explanation of the photochemical processes inside the luminous cloud. Author (ESRO)

N70-30515# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
COMPLEMENT ON THE SIX IMPULSE, OPTIMAL RENDEZVOUS OF MEDIUM DURATION, BETWEEN NEAR CIRCULAR, NON COPLANAR, CLOSE ORBITS [COMPLEMENT SUR LES RENDEZ-VOUS HEXA-IMPULSIONNELS, OPTIMAUX, DE DUREE MOYENNE ENTRE ORBITES QUASI-CIRCULAIRES, PROCHES, NON COPLANAIRES]
Jean-Pierre Marec 1969 19 p refs In FRENCH; ENGLISH summary Presented at 20th Intern. Congr. on Astronautics, Mar del Plata, Argentina, 6-10 Oct. 1969
(ONERA-TP-763) Avail: CFSTI

A second family of six-impulse solutions is considered. The resolution of the problem is based on the study of the evolution, as a function of time, of the length of the first vector. For a well defined rendezvous of the second family, the impulses are nearly tangential and are applied in the first and the last revolution. The six-impulse portion of the domain, in the space of the variations of the orbital elements, which can be reached with a given characteristic velocity is studied in the case of isoenergetic rendezvous, in which the line of the nodes is perpendicular to the axis of symmetry of the transfer arc, and which take place in an integer number of revolutions. Author

N70-30576*# Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.
ASTROMETRY AND ASTROPHYSICS, NO. 5: PROBLEMS OF ATMOSPHERIC OPTICS
I. G. Kolchinskiy, ed. Washington NASA Jun. 1970 refs Transl. into ENGLISH of the publ. "Astrometriya i Astrofizika, 5. Voprosy Atmosfernoy Optiki" Kiev, Naukova Dumka, 1969 p 1 131
(Contract NASw-1692)
(NASA-TT-F-606) Avail: CFSTI CSCL 03B

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5. DEPENDENCE OF STAR IMAGE FLICKERING ON METEOROLOGICAL CONDITIONS G. V. Moroz p 66 76 refs (See N70-30581 15-30)
6. SOME RESULTS OF OBSERVATION OF SPECTRA OF STARLIGHT SCINTILLATION CARRIED OUT ON THE 200-mm MAKSUTOV REFLECTOR AZT-7 AT GOLOSEYEVO (KIEV SUBURB) E. M. Diamant et al p 77 93 refs (See N70-30582 15-30)
7. ON THE ASTROCLIMATE OF TWO POINTS IN THE TRANSCARPATHIAN AND ODESSA REGIONS OF THE UKRAINIAN SSR L. R. Lisina et al p 94 101 refs (See N70-30583 15-30)
8. INVESTIGATION OF FLICKERING AMPLITUDE COMPONENTS BY TRACES OF ARTIFICIAL SATELLITES: THE BEADED STRUCTURE OF STAR TRACES I. V. Shvalagin et al p 102 106 refs (See N70-30584 15-30)

N70-30578*# Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.
OBSERVATIONS OF ASTRONOMICAL REFRACTION AT GREAT ZENITH DISTANCES MADE IN GOLOSEYEVO (KIEV SUBURB)
N. A. Vasilenko *In its* Astrometry and Astrophys., No. 5 Jun. 1970 p 28 41 refs (See N70-30576 15-30)
Avail: CFSTI CSCL 03B

The results of observations of astronomical refraction near the horizon taken on a two-second multipurpose instrument are given. The maximum deviation of the measured refraction from the calculated refraction on the basis of the Pulkovo tables reaches 1 min at a zenith distance of 89.5 deg. In some cases the measured refraction was compared with that obtained by the method of numerical integration of atmospheric sounding data. The measured refraction was less than that calculated. The deviations are 3 4 percent of refraction value, which is difficult to explain by human or instrumental observational errors. Author

N70-30579*# Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.
THE ATMOSPHERE DISPERSION AND THE LUMINOSITY FUNCTION FOR THE 400-mm ASTROGRAPH OF THE MAIN ASTRONOMICAL OBSERVATORY OF THE ACADEMY OF SCIENCES OF THE UKRAINIAN SSR
A. B. Onegina *In its* Astrometry and Astrophys., No. 5 Jun. 1970 p 42 50 refs (See N70-30576 15-30)
Avail: CFSTI CSCL 03B

The results of determining the atmospheric dispersion and the magnitude equation on plates taken with the 400-mm astrograph are given. The value obtained for the atmospheric dispersion constant is 0.17 + or 0.03 sec for stars whose color indices differed by one magnitude at a zenith distance of 45. The magnitude equation obtained is + or 0.014 sec in x and 0.015 sec in y for one magnitude difference. Probable errors are + or 0.003 sec in both coordinates. Author

N70-30580*# Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.
A STUDY OF STAR IMAGE FLICKERING BASED ON OBSERVATION OF TRACES CARRIED OUT ON THE AZT-7 TELESCOPE (200-mm REFLECTOR) IN 1963
G. V. Moroz *In its* Astrometry and Astrophys., No. 5 Jun. 1970 p 51 65 refs (See N70-30576 15-30)
Avail: CFSTI CSCL 03B

Star image flickering was investigated in 1963 in Goloseyevo (Kiev suburb) by the trace method on the 200-mm Maksutov reflector (AZT-3). The results of measuring 267 traces obtained during 20 nights show that the rms value of the oscillations are proportional to (sec z)-(0.5), which is in agreement with earlier results of I.G. Kolchinskiy. On different nights the value of the exponent lies between 0.0 - 0.9. The rms of image motion at the zenith for each night lies between 0.3 - 0.5 sec. Author

N70-30581*# Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.

DEPENDENCE OF STAR IMAGE FLICKERING ON METEOROLOGICAL CONDITIONS

G. V. Moroz *In its* Astrometry and Astrophys., No. 5 Jun. 1970 p 66 76 refs (See N70-30576 15-30)
Avail: CFSTI CSCL 03B

Meteorological conditions and their influence on the dependence of the amount of image flickering on zenith distances are studied. It was established that under anticyclone conditions image flickering is nearly constant at all zenith distances and decreases slightly at the zenith. If the atmosphere over the point of observation has the characteristics of an unstable air mass, the image flickering increases regularly with the zenith distances. Author

N70-30582*# Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.

SOME RESULTS OF OBSERVATIONS OF SPECTRA OF STARLIGHT SCINTILLATION CARRIED OUT ON THE 200-mm MAKSUTOV REFLECTOR AZT-7 AT GOLOSEYEVO (KIEV SUBURB)

E. M. Diamant et al *In its* Astrometry and Astrophys., No. 5 Jun. 1970 p 77 93 refs (See N70-30576 15-30)
Avail: CFSTI CSCL 03B

Some results of observations of starlight scintillation carried out with the 200-mm Maksutov reflector at Goloseyevo in 1965 67 are given. The spectra were recorded with a heterodyne-type analyzer in the frequency band of 0.5 - 70 Hz. Author

N70-30583*# Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.

ON THE ASTROCLIMATE OF TWO POINTS IN THE TRANSCARPATHIAN AND ODESSA REGIONS OF THE UKRAINIAN SSR

L. R. Lisina et al *In its* Astrometry and Astrophys., No. 5 Jun. 1970 p 94 101 refs (See N70-30576 15-30)
Avail: CFSTI CSCL 03B

Astroclimatic conditions of two points in the Ukrainian SSR (Dubrovka in the Transcarpathian and Zhovtnevoye in the Odessa region) are compared. The observations were carried out during the summer of 1961. Data on image quality and flickering and atmospheric transmission were obtained. Author

N70-30584*# Aztec School of Languages, Inc., Maynard Mass. Research Translation Div.

INVESTIGATION OF FLICKERING AMPLITUDE COMPONENTS BY TRACES OF ARTIFICIAL SATELLITES: THE BEADED STRUCTURE OF STAR TRACES

I. V. Shvalagin et al *In its* Astrometry and Astrophys., No. 5 Jun. 1970 p 102 106 refs (See N70-30576 15-30)
Avail: CFSTI CSCL 03A

The article proves that image motion determined from the traces of stars and artificial satellites and obtained at roughly the same time is approximately equal. The beaded structure of satellite traces is studied. The mean value of the interval between the beads is 0.91 sec. Author

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N70-29260 Advisory Group for Aerospace Research and Development, Paris (France).

WIND EFFECTS ON LAUNCH VEHICLES

E. D. Geissler (NASA. Marshall Space Flight Center) Feb. 1970 280 p refs
(AGARDograph-115) Copyright. Avail: Issuing Activity

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2. THE WIND FIELD J. R. Scoggins (NASA. Marshall Space Flight Center) p 33 – 74 refs (See N70-29262 15-20)
3. AERODYNAMIC CONSIDERATIONS T. G. Reed and E. L. Linsley (NASA. Marshall Space Flight Center) p 75 – 114 refs (See N70-29263 15-01)
4. STRUCTURAL ASPECTS OF AIRFRAME DESIGN V. S. Verderaime and G. F. McDonough (NASA. Marshall Space Flight Center) p 115 – 161 refs (See N70-29264 15-32)
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7. VEHICLE RESPONSE TO ATMOSPHERIC DISTURBANCES R. S. Ryan (NASA. Marshall Space Flight Center) p 228 – 288 refs (See N70-29267 15-32)

N70-29261* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

INTRODUCTION

E. D. Geissler, G. F. Mc Donough, W. D. Murphree, and J. C. Blair *In* AGARD Wind Effects On Launch Vehicles Feb. 1970 p 13 – 32 refs (See N70-29260 15-31)
Copyright. Avail: Issuing Activity CSCL 22D

The effects of wind on space vehicle design, methods of investigation, and the quantitative importance of specific phenomena are summarized. Large launch vehicles as represented by the family of Saturn vehicles are emphasized, and details are given on the Saturn stages, and guidance and control systems. Differences between Saturn configurations are described, and problems involved in configuration selection are discussed. N.E.N.

N70-29494*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

EQUATIONS FOR A STUDY OF A ROLL-OUT CLAMSHELL EJECTION CONCEPT FOR SPINNING ROCKET VEHICLES

Lawrence F. Hatakeyama Washington Jun. 1970 25 p refs
(NASA-TN-D-5810; G-977) Avail: CFSTI CSCL 22B

Equations for estimating the motion, forces, and couples applicable to the design of clamshell systems utilizing a new roll-out ejection concept are presented. Both the deployment and the free flight phases of the clamshell ejection are considered. No attempt is made to answer the thermal, vibratory, and structural detail problems of these clamshells. Author

N70-29538# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ON TOP OF THE ROCKET

Boris Kolesov 3 Oct. 1969 10 p Transl. into ENGLISH from Trud (Moscow), pt. 1, 15 May 1969
(AD-700295; FTD-HT-23-466-69) Avail: CFSTI CSCL 22/2

The article explains the purpose and functioning of the Emergency Escape System (EES), contained in the inverted metal cup on top of the Soviet spaceships Soyuz-4 and -5. This system is designed to help save the lives of the crew in case serious malfunctioning of the launch vehicle during the launch and throughout

all the phases of the powered flight trajectory when putting the spacecraft into orbit. The article also discusses other emergency systems and safety features of the Soyuz spacecraft.
Author (TAB)

N70-29740*# National Aeronautics and Space Administration, Washington, D.C.
SOLID ROCKET MOTOR METAL CASES
Apr. 1970 103 p refs
(NASA-SP-8025) Avail: CFSTI CSCL 21H

The design objective is to produce a motor case that will fulfill mission requirements at minimum cost. A motor case design that is less than this optimum may result from failure to coordinate design requirements with constraints or from failure to select the best design approach. Therefore, specific guidelines and practices are required to assure that the motor case is of an optimum design for the mission objectives. Guidelines and practices are established for use either in initial case design or design improvement. They provide direction for the application of various case design technologies that have been successful. Also, the tradeoffs, risks, or consequences are discussed in those areas where more than one acceptable approach is available to satisfy the design requirements.
Author

N70-29808*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LIFTING ENTRY (L/D = OR < 0.2) FOR UNMANNED VIKING CLASS MARS LANDERS
E. Brian Pritchard and Edwin F. Harrison Washington Jun. 1970 40 p refs
(NASA-TN-D-5828; L-7074) Avail: CFSTI CSCL 22B

An analysis was performed to define the capabilities of lifting-entry vehicles for both the out-of-orbit and direct entry modes for Viking class Mars missions. It is shown that for either out-of-orbit entry or direct entry with approach guidance, use of a vehicle with L/D of approximately 0.1 provides reductions in parachute deployment conditions, increases in terrain-height allowances, or payload-growth potential in comparison with a ballistic vehicle. An L/D of approximately 0.2 is required to perform the Viking class mission for direct entry without approach guidance unless large hypersonic ballutes are to be developed for the ballistic vehicle.
Author

N70-30135# National Research Council of Canada, Ottawa (Ontario).
BLACK BRANT ROCKETS AMF-3-46 AND AMF-3-47 LAUNCHED AT CHURCHILL RESEARCH RANGE, 3 DECEMBER 1969
Apr. 1970 27 p
(SRFB-039; PD-10031) Avail: CFSTI

The engineering aspects of preparing the payloads and the launching of Black Brant rockets AMF-3-46 and AMF-3-47 at Churchill Research Range on 3 December 1969 are reported. Vehicles carried identical payloads of six photometers and four chemical atomic oxygen sensors. Photometrically simultaneous emissions resulting from atomic oxygen recombination in the 125 kilometer altitude range under quiet atmospheric conditions were measured. Both vehicles performed satisfactorily with good telemetry being received. A partial photometer experiment failure in AMF-3-47 and failure of the oxygen atom probe experiments in both vehicles resulted in a reduction of useful scientific data.
Author

N70-30136*# Bellcomm, Inc., Washington, D.C.
CONTOUR SPECTROGRAMS FOR POGO ANALYSIS
A. T. Ackerman, L. A. Ferrara, and J. J. O'Connor 10 Apr. 1970 47 p
(Contract NASw-417)
(NASA-CR-110409; B70-04034) Avail: CFSTI CSCL 22B

In the work on Saturn V POGO problems, a commercially available spectrum analyzer was found which can preserve signal amplitude by creating contour lines of constant signal level on a two dimensional plot with frequency and time axes. A brief description of this equipment concentrates on the inherent flexibility in displaying the resulting spectrograms. Some 24 contour spectrograms are presented for six S-II flight measurements and two S-IVB-507 flight measurements. The previously published intensity spectrograms of these eight measurements are again presented for comparison; the intensity spectrograms forego amplitude preservation to allow an Automatic Gain Control action to search into the noise for the presence of a signal. The trade-off between the contour and intensity spectrograms is not straight forward and depends on the particular characteristics of the signal to be detected. This study shows the obvious advantage of having both types of spectrograms.
Author

N70-30154*# National Aeronautics and Space Administration, Washington, D.C.
A FLAT BLADE IN THREE SECTIONS: THE FIRST SECTION PRODUCES MOTIVE FORCE, THE SECOND SECTION IS THE SUPPORTING SURFACE AND THE THIRD SECTION IS A STABILIZER [UN PLANO ALA DIVIDIDO EN TRES PARTES, UNA PARTE ES LA PRODUCTORA DE FUERZA MOTRIZ, OTRA DE SUSTENTACION Y LA TERCERA DE ESTABILIZACION]
Arturo Estevez Varela May 1970 7 p Transl. into ENGLISH from Spanish Patent No. 371764 (1969) 7 p
(NASA-TT-F-13109) Avail: CFSTI CSCL 22B

An automatic braking device is described that can be used for recovery of unmanned spacecraft, command modules, manned and unmanned satellites, and any other body found on planets that have an atmosphere. The system can be mounted on any structure without interior or exterior changes in body design.
Author

N70-30203# British Aircraft Corp. (Operating) Ltd., Bristol (England). Space Systems Group.
BRITISH INTERPLANETARY SOCIETY SOUNDING ROCKET SYMPOSIUM: CONTRIBUTIONS BY THE BRITISH AIRCRAFT CORPORATION
Apr. 1970 97 p Symp. held at Cardiff, UK, Apr. 1970
(ESS/SS-38) Avail: CFSTI

CONTENTS:

1. RECENT DEVELOPMENTS IN THE SKYLARK SOUNDING ROCKET G. E. Lewis 16 p (See N70-30203 15-31)

2. SKYLARK DATA REDUCTION B. Stallard 17 p (See N70-30204 15-31)

3. THE IMPACT DISPERSION OF SOUNDING ROCKETS J. W. Furst 15 p (See N70-30205 15-31)

4. THE APPLICATION OF THRUST VECTOR CONTROL TO THE SKYLARK VEHICLE J. W. Furst 16 p (See N70-30206 15-31)

5. THE FUTURE USE OF PCM TELEMETRY IN SOUNDING ROCKETS T. T. Walters 22 p (See N70-30207 15-07)

6. THE ROLE OF INDUSTRY J. R. Powell 9 p (See N70-30208 15-31)

N70-30204# British Aircraft Corp. (Operating) Ltd., Bristol (England).
RECENT DEVELOPMENTS IN THE SKYLARK SOUNDING ROCKET
G. G. E. Lewis *In its* Brit. Interplanet. Soc. Sounding Rocket Symp.: Contrib. by the Brit. Aircraft Corp. Apr. 1970 16 p (See N70-30202 15-31)
(ESS/SS-38/1) Avail: CFSTI

This paper gives a short history of the Skylark upper atmosphere sounding rocket and describes recent developments with the Raven motor and the Cuckoo and Goldfinch boosters, and the reduction of the weight, dispersion and length of the launcher. Future developments are also considered. ESRO

N70-30205# British Aircraft Corp. (Operating) Ltd., Bristol (England).

SKYLARK DATA REDUCTION

G. B. Stallard *In its* Brit. Interplanet. Soc. Sounding Rocket Symp.: Contrib. by the Brit. Aircraft Corp. Apr. 1970 17 p (See N70-30202 15-31)
(ESS/SS-38/2) Avail: CFSTI

The editing, calibration, magnetometer data filtering and attitude analyses of Skylark rocket telemetry data are described. The error criteria used in the attitude program for the sun/moon slit, magnetometer and horizon sensors are also discussed. ESRO

N70-30206# British Aircraft Corp. (Operating) Ltd., Bristol (England).

THE IMPACT DISPERSION OF SOUNDING ROCKETS

J. W. Furst *In its* Brit. Interplanet. Soc. Sounding Rocket Symp.: Contrib. by the Brit. Aircraft Corp. Apr. 1970 15 p (See N70-20202 15-31)
(ESS/SS-38/3) Avail: CFSTI

The principal sources of sounding rocket dispersion are wind measurement errors and thrust misalignments. The former can be reduced by lowering the aerodynamic stability provided no unwanted side-effects are introduced. Thrust misalignments can be significantly reduced without great complication by spinning the rocket at the start of its flight. The properties of the boosted Skylark rocket vehicle are considered in detail. ESRO

N70-30207# British Aircraft Corp. (Operating) Ltd., Bristol (England).

THE APPLICATION OF THRUST VECTOR CONTROL TO THE SKYLARK VEHICLE

J. W. Furst *In its* Brit. Interplanet. Soc. Sounding Rocket Symp.: Contrib. by the Brit. Aircraft Corp. Apr. 1970 16 p (See N70-30202 15-31)
(ESS/SS-38/4) Avail: CFSTI

A study of a possible thrust vector control system for the boosted Skylark rocket vehicle showed that a significant reduction of dispersion would result from a 3 deg deflection of the main jet. The lateral loading during the controlled phase is kept to a low level and the loss of performance is not detrimental. ESRO

N70-30209# British Aircraft Corp. (Operating) Ltd., Bristol (England).

THE ROLE OF INDUSTRY

J. R. Powell *In its* Brit. Interplanet. Soc. Sounding Rocket Symp.: Contrib. by the Brit. Aircraft Corp. Apr. 1970 9 p (See N70-30202 15-31)
(ESS/SS-38/6) Avail: CFSTI

The wide range of skills needed by sounding rocket contractors are described and the supply, payload, data analyses, design and launching activities, etc., are discussed. ESRO

N70-30278# Bristol Aerojet, Ltd., Banwell (England).

THE DEVELOPMENT OF PETREL

W. T. Fisher 1970 14 p refs Presented at the Brit. Interplanet. Soc. Symp. on Sounding Rockets, Cardiff, UK, Apr. 1970
Avail: CFSTI

The development of the Petrel sounding rocket, and the history of the Skua rocket vehicle conceived at the same time, are described. This report covers initial design and subsequent developments including roll incorporation, rocket behavior and performance at ESRANGE. ESRO

N70-30314# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

POSSIBILITIES UNLIMITED: A TALK WITH THE CHIEF DESIGNER OF THE SOYUZ SPACECRAFT

S. Borzenko 1 Dec. 1969 6 p Transl. into ENGLISH from Pravda (Moscow), 16 Oct. 1969 p 5
(AD-702281; FTD-HT-23-544-69) Avail: CFSTI CSCL 22/2

The chief designer of the Soyuz spacecraft series discusses some of the national economic applications of manned space flight. TAB

N70-30450# European Space Research and Technology Center, Noordwijk (Netherlands).

THE SCIENTIFIC EXPERIMENTS OF THE ESRO-1 SATELLITES

R. Jaeschke Jan. 1970 62 p refs
(ESRO.SN-106-(ESTEC)) Avail: CFSTI

The aim of the ESRO-1 project is in the study and exploration of the polar ionosphere and aurorae. ESRO-1A (Aurorae) was launched in October 1968 and in view of its excellent performance it was decided to launch the second flight model, ESRO-1B/Boreas, on a slightly different orbit, a year later. Each satellite contains the same eight experiments; five are concerned with particle measurements, one is an auroral photometry experiment, and the other two are probe experiments to investigate the electron and ion density and temperature distributions. This report outlines the aims, main features, and operating characteristics of each of the experiments. Author (ESRO)

N70-30480# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SPACECRAFT CARRY OUT COMPLEX MANEUVERS IN ORBIT

V. Smirnov 1 Dec. 1969 8 p Transl. into ENGLISH from Pravda (Moscow), 19 Oct. 1969 p 3
(AD-703174; FTD-HT-23-541-69) Avail: CFSTI CSCL 22/2

The deputy director of a flight control center answers a newsmans questions on certain aspects of the triple Soyuz flight. Particular attention is called to the continuity of Soviet space developments and to the expanding role of the human agent in space flight. Author (TAB)

N70-30517# Bristol Aerojet, Ltd., Banwell (England).

PETREL PAYLOADS: DESIGN, BALANCE AND TESTING

J. B. Hilton 1970 12 p refs Presented at the Brit. Interplanet. Soc. Symp. on Sounding Rockets, Cardiff, Apr. 1970
Avail: CFSTI

A description is given of the design, balance, and testing of payloads for the Petrel sounding rocket. Points covered include lock in and lock out of resonance, static stability, coning, payload imbalance, vibration testing, and kinetic heating. ESRO

N70-30521# Instituto Nacional de Tecnica Aerospacial, Madrid (Spain).

DEVELOPMENT OF THE INTA-255 SOUNDING ROCKET

P. Sanz-Aranguez Sanz [1970] 9 p Presented at the Brit. Interplanet. Soc. Symp. on Sounding Rockets, Cardiff, Engl., Apr. 1970
Avail: CFSTI

The Spanish INTA-255 sounding rocket with a solid propellant Goose 2 motor and Chick 2 rocket booster motors for launching 20 kg into the ionosphere is described. The results of two 1969 test firings are discussed and the ground facilities at the Arenosillo range on the Atlantic coast near Huelva are listed. ESRO

N70-30585# Bristol Aerojet, Ltd., Banwell (England).

PETREL: PERFORMANCE AND FACILITIES

N. Rogers and C. D. Papworth 1970 17 p refs Presented

at the Brit. Interplanet. Soc. Symp. on Sounding Rockets, Cardiff, UK, Apr. 1970
Avail: CFSTI

The performance, telemetry, nose cones and boosters, etc., of the Petrel sounding rocket are described. A direct comparison of results of firings at Hebridean and Swedish ranges was not possible, because of differences in the ambient atmosphere. ESRO

N70-30586# Science Research Council, London (England).
BRITISH NATIONAL AND COMMONWEALTH COLLABORATIVE SOUNDING ROCKET PROGRAMMES
B. G. Pressey 1970 11 p refs Presented at the Brit. Interplanet. Soc. Symp. on Sounding Rockets, Cardiff, UK, Apr. 1970
Avail: CFSTI

The rocket facilities now available for both the U.K. national and Commonwealth co-operative programs are described. Nearly 200 Skylark rockets have been launched since 1957 and star pointing rockets will be used in 1970. The extent and size of the U.K. program is discussed along with the 1970 Petrel and Skua firings at Thumba, India, and the 1971 firings at Sonmiani, Pakistan. Author (ESRO)

N70-30592*# Space Data Corp., Phoenix, Ariz.
A STUDY OF 30 km TO 200 km METEOROLOGICAL ROCKET SOUNDING SYSTEMS. VOLUME 1, PART 1: LITERATURE AND DATA REVIEW
Bruce Bollerman May 1970 442 p refs
(Contract NAS8-20797)
(NASA-CR-1529-PT-1) Avail: CFSTI CSCL 04B

The contemporary literature on meteorological rockets and associated systems is reviewed to determine the accuracies and limitations of the current meteorological rocket systems from available data, and to determine the adaptability of the more complex geophysical rocket experiments to simplified, economical, routine meteorological rocket soundings. The various system requirements and techniques used in obtaining meteorological measurements of the 30 km to 200 km region of the atmosphere are described. Author

N70-30599# Centro Studi Trasporti Missilistici, Rome (Italy).
BORA-SOND UPPER ATMOSPHERE SOUNDING VEHICLE FOR SST APPLICATION
G. A. Partel 1970 5 p refs Presented at the Brit. Interplanet. Soc. Symp. on Sounding Rockets, Cardiff, Engl., Apr. 1970
Avail: CFSTI

The Bora-Sond is a low cost system for atmospheric sounding at 120 km. The first stage is a recoverable instant hot-water propulsion system of a chemical nature with no flame or explosion. The second stage uses hot hydrogen as a high energy fuel. Lithium-aluminum-oxygen systems and aluminum combustion with water were investigated. The rocket will be prepackaged with the propellants being filled and sealed in the factory. ESRO

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N70-29231# Sandia Corp., Albuquerque, N.Mex.
TRANSIENT RESPONSE OF A PLASTICALLY ANISOTROPIC CYLINDER IN PLANE STRAIN
T. A. Duffey Dec. 1969 35 p refs
(SC-RR-69-820) Avail: CFSTI

An anisotropic plastic analysis of a long cylinder subjected to internal impulsive pressure loading is presented. Transient response formulas are expressed in terms of elementary functions. The analysis is a generalization of earlier work for an isotropic plastic material. Comparisons between transient deflections for plastically anisotropic and isotropic materials indicate differences as large as 35 percent, even when uniaxial material properties are identical along principal directions in the cylinder reference surface. Author (NSA)

N70-29234 California Inst. of Tech., Pasadena.
MODAL REPRESENTATIONS FOR THE HIGH-FREQUENCY RESPONSE OF ELASTIC PLATES
Philip Wayne Randles (Ph.D. Thesis) 1969 249 p
Avail: Univ. Microfilms: HC $11.25/Microfilm $3.25 Order No. 69-19593

Representations for the high-frequency response of a suddenly loaded infinite plate are obtained from the modal form of the exact solution. The method of approach is presented by treating a linearly elastic, homogeneous, isotropic plate subjected to a normal impulsive line load on one face. An investigation of the branches of the governing Rayleigh-Lamb frequency equation is given. These branches are closely related to the modes of propagation, the sum of which is the modal solution. The relationship between the high-frequency portions of the underlying frequency spectra and the high-frequency response is brought out. Series representations for the branches are used to facilitate a summation over the branch (or mode) numbers. This results in convenient high-frequency representations, which exhibit all of the expected singular wave fronts in the plate. The method appears to be applicable to a broader class of problems than other methods which have been used for the high-frequency response of a plate. Dissert. Abstr.

N70-29248 Drexel Inst. of Tech., Philadelphia, Pa.
ANALYSIS OF THE AXISYMMETRICAL MOTIONS OF A TWO LAYERED CYLINDRICAL SHELL BY THE METHOD OF CHARACTERISTICS
Richard Franklin Perry (Ph.D. Thesis) 1969 118 p
Avail: Univ. Microfilms: HC $5.80/Microfilm $3.00 Order No. 69-17865

The method of characteristics is extended to solve the problem of a composite two layered shell. The shell is semi-infinite, with each of the two isotropic, homogeneous layers distinct and joined by a rigid bond. The three partial differential equations governing the motion of the shell are solved for a particular set of boundary conditions which include a jump discontinuity in one of the velocity variables, and zero initial conditions. Results of a computer analysis are presented in graphical form, which include the study of the propagation of jump discontinuities. The mathematical classification of system of second order partial differential equations is presented. The application and significance to problems of structural dynamics in addition to that of the two layered cylindrical shell are shown. Dissert. Abstr.

N70-29264* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STRUCTURAL ASPECTS OF AIRFRAME DESIGN
V. S. Verderaime and G. F. Mc Donough *In* AGARD Wind Effects on Launch Vehicles Feb. 1970 p 115–161 refs (See N70-29260 15-31)
Copyright. Avail: Issuing Activity

Some fundamental relations needed for defining loads are given followed by a discussion of several structural dynamic factors needed later for a dynamic analysis of vehicle response to wind. This includes both the fundamental bending characteristics of the airframes and the propellant dynamics. While the latter subject is given rather condensed treatment, a fairly extensive discussion is devoted to the methods and results regarding description of airframe dynamic mode shapes, frequencies and damping. This subject represents a very critical input to the layout of the control system for the evaluation of structural loads. General airframe design veiwpoints are given particularly for the control engineer and aerodynamicist but may also be of interest to designers not familiar with the design of large space vehicles. Author

N70-29267* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

VEHICLE RESPONSE TO ATMOSPHERIC DISTURBANCES

R. S. Ryan *In* AGARD Wind Effects on Launch Vehicles Feb. 1970 p 228 288 refs (See N70-29260 15-31)

Copyright. Avail: Issuing Activity

Systematic discussions of typical results of certain types of analysis applied at various stages of development are presented to indicate their usefulness and, at the same time, to show their typical deployment through the development cycle to get some insight into the numerical relations and relative importance of various dynamical phenomena and certain effects for the Saturn 5 vehicle. By a comparison between deterministic and statistical results, proof is furnished of the adequacy of the synthetic wind profile for the Saturn vehicles which was used largely during their development. Author

N70-29294 Polytechnic Inst. of Brooklyn, N.Y.

THERMOELASTIC-DYNAMIC RESPONSE OF SANDWICH CYLINDRICAL SHELLS

Joseph Anthony Padovan (Ph.D. Thesis) 1969 155 p

Avail: Univ. Microfilms: HC $7.20/Microfilm $3.00 Order No. 69-20357

The generalized Hamilton's principle is extended to include the additional effect of thermal energy. Minimizing criteria similar to the Euler equations are then derived for elastic materials. Based on these criteria a complete system of dynamic equations is obtained for sandwich as well as homogeneous cylindrical shells, which include the effects of an arbitrary temperature distribution and thickness-shear deformation in all layers. The eigenvalues for both the asymmetric and axisymmetric modes are determined according to the refined theory for cylindrical sandwich shells and are shown to reduce to the results given by Yu for the special case of axisymmetric vibrations of sandwiches with membrane face layers. A comparison of results between the eigenvalues obtained from the refined theory with those for sandwiches with membrane face layers reveals the importance of including thickness-shear deformation in all layers, especially for the lowest eigenvalues of the ordinary sandwich. An exact solution of the shell equations is then obtained for the thermo elastic-dynamic response to transient temperature excitation of closed and split sandwich cylindrical shells with freely supported edges. Dissert. Abstr.

N70-29300 Stanford Univ., Calif.

TWO PROBLEMS IN STRUCTURAL STABILITY

Laszlo Berke (Ph.D. Thesis) 1968 136 p

Avail: Univ. Microfilms: HC $6.60/Microfilm $3.00 Order No. 69-8151

Buckling and post-buckling behavior of complete spherical shells of high radius to thickness ratio was investigated. High speed motion pictures are obtained to show that buckling under uniform external pressure begins with a small rotationally symmetric dimple. However, as this dimple grows in size, it loses its symmetry and a variety of nonsymmetric mode shapes follow, which then dominate both the dynamic and the statically stable phases of post-buckling equilibrium. As a stability problem of a different nature, the creep buckling of initally imperfect flat rectangular plates was investigated. Computer programs were developed to solve the governing system of coupled nonlinear algebraic and differential equations derived for various orders of approximation. With the aid of these computer programs an investigation was carried out to determine the effects of the creep exponent in the power creep law, the effects of the magnitude of the initial imperfections and the effects of various refinements in the approximation for stresses and displacements. Dissert. Abstr.

N70-29344# Shock and Vibration Information Center (Defense), Washington, D.C.

THE SHOCK AND VIBRATION BULLETIN, AUGUST 1968

Aug. 1968 307 p refs Proceedings of the Symp. on Shock, Vibration and Assoc. Environments (38th), St. Louis, 1 - 2 May 1968

(AD-683313; NRL-BULL-38-Pt-2) Avail: CFSTI CSCL 20/11

The report documents stress and vibration analyses of shipborne and spaceborne structural components presented at the symposium on shock, vibration and related environments held in St. Louis, Mo., May 1-2, 1968. TAB

N70-29402# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

TECHNIQUES USED IN AEROELASTICITY FOR THE AIRCRAFT REPRESENTATION IN FLIGHT [LES TECHNIQUES UTILISEES EN AEROELASTICITE POUR LA REPRESENTATION DE L'AVION EN VOL]

Roland Dat and Christian Beatrix *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 22 p refs In FRENCH; ENGLISH summary (See N70-29401 15-02)

Avail: CFSTI

The study of the behaviour of a flexible aircraft in flight is extremely complex. The methods used for predicting aeroelastic instabilities, and in particular flutter, are discussed. Linearization is justified, provided small amplitude motions on either side of the mean position are considered. Then, discretization is obtained by representing the motion in a space function base. It can then be systematically put in equation form, starting from energy and virtual work. The particular advantages of the base of the natural vibration mode shapes of the aircraft on the ground are shown; rapid convergence, possibility of determining structure characteristics through vibration tests as well as design calculations. Lastly, the methods used for evaluating unsteady aerodynamic forces are presented: strip theory, and lifting surface theory. Such techniques adapted to a number of flight dynamics problems, because the overall motions are taken into account without any difficulty. Author

N70-29409# Sud-Aviation, Marignane (France).

AEROELASTIC EFFECTS ON FLIGHT QUALITIES OF A RIGID ROTOR [EFFETS AEROELASTIQUES SUR LE QUALITES DE VOL D'UN ROTOR RIGIDE]

J. Gallot *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 9 p refs In FRENCH (See N70-29401 15-02)

Avail: CFSTI

Theoretical and experimental results are presented to show the importance of elastic characteristics of the blade and of aeroelastic phenomena on the flight qualities of a rigid rotor helicopter. Consideration is given to such factors as the effects of the rotor, fuselage, and stabilizer on static attitude stability; stability with large and small stabilizers; aircraft response to cyclic step input; blade tip weights; and the influence of rotor rotational speed on dynamic stability. Transl. by M.G.J.

N70-29419# Royal Aircraft Establishment, Farnborough (England).

FLIGHT AND GROUND LOAD MEASUREMENTS BY STRAIN GAUGES

P. B. Hovell *In* AGARD Aeroelastic Effects from a Flight Mech. Standpoint Mar. 1970 12 p refs (See N70-29401 15-02)

Avail: CFSTI

The loads which should be measured in structural integrity tests and the techniques available for the interpretation of strain measurements for such purposes are discussed. There is a need to measure the overall loads acting on the major components for the study of many loading actions, but a knowledge of the local internal loads is required when the environment of flight provides the loading actions. These occur in flight through turbulent air and taxying over a rough runway. Instrumentation problems: recording equipment, strain gages and adhesives are not discussed. Author

N70-29442# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

BREATHING VIBRATIONS OF A THIN CYLINDRICAL SHELL WITH PERIPHERAL STIFFENERS. APPLICATION TO THE TRANSMISSION OF VIBRATIONS [VIBRATIONS DE RESPIRATION D'UNE COQUE CYLINDRIQUE MINCE AVEC RAIDISSEURS CIRCONFERENTIELS. APPLICATION A LA TRANSMISSION DES VIBRATIONS]

Mathieu Bilik (Ph.D. Thesis--Paris Univ., Orsay, 17 Apr. 1969) 1969 120 p refs In FRENCH; ENGLISH summary
(ONERA-NT-151) Avail: CFSTI

Reinforcement rings applied to some part of a cylinder other than its two ends do not affect its boundary conditions. The new natural modes can be expressed in terms of the complete base formed by the natural modes of the cylinder proper. By writing Legrange's equations into this base, a general formulation of the problem can be derived. The boundary conditions chosen are those of the standard 'articulated' type, which make for the simplest expression of the base modes. The case of end stiffeners is considered separately. The suggested method does not postulate stiffeners of identical design or equal spacing, and their number is in principle optional. A particular application is in an advance estimate of the transmission of vibrations between cylinders of equal thickness, using a hypothesis whereby the connection can be assimilated to a single stiffener. A numerical example for a single stiffener and for two different types of connection is followed by experimental evidence. Author

N70-29504# Southwest Research Inst., San Antonio, Tex.

EFFECTS OF OUT-OF-ROUNDNESS AND RESIDUAL STRESSES ON RING REINFORCED STEEL SHELLS Final Report

L. F. Greimann, R. C. De Hart, and C. R. Franz 23 Oct. 1969 103 p refs Prepared for Am. Iron and Steel Inst.
(NVO-193-9) Avail: CFSTI

Results of investigations are presented concerning the effects of fillet welds, residual stresses and out-of-roundness on ring stiffened cylindrical steel shells used as casing in holes for underground nuclear tests. The models used in the investigation are described. Analytical results are presented and compared with experimental data. NSA

N70-29548# California Univ., Berkeley. Structural Engineering Lab.

A COMPUTER PROGRAM FOR THE ANALYSIS OF TUBULAR K JOINTS

Ojars Greste Nov. 1969 88 p refs
(PB-189501; SESM-69-19) Avail: CFSTI CSCL 13M

A program for the finite element analysis of tubular K joints is presented. The type of structure consists of two pipes intersecting a third; the type of analysis performed is static-linear-elastic. The discretization of the structure into an assemblage of quadrilateral and triangular elements is carried out by the computer program. Four degrees of finite element mesh refinement are offered and the meshes can be plotted if suitable equipment is available. A variety of boundary and loading conditions can be applied. The program provides displacements, moments and membrane forces, and surface stresses of the structure. Author (USGRDR)

N70-29650# Catholic Univ. of America, Washington, D.C. Inst. of Ocean Science and Engineering.

STATIC AND DYNAMIC RESPONSE OF A SUBMARINE-LIKE STRUCTURE

Nicholas L. Basdekas and Michael Chi Dec. 1969 35 p refs
(Contract N00014-69-A-0432)
(AD-702057; Rept-69-9) Avail: CFSTI CSCL 13/13

The dynamic response of a submarine-like shell structure is analyzed. In the formulation, the shell is allowed to have any prescribed thickness variation, any number of stiffening rings of arbitrary cross-section and spacing, and, in addition, to have any number of concentrated masses, attached either to the shell or to the stiffening rings, to represent machinery and equipments. The method of solution is a modified variational method. First, the displacement is assumed to be representable by a series of the product of the normal modes of a simple uniform shell and unknown functions which are dependent only on time. The effects of nonuniformity of the shell, the presence of stiffening rings and attached mass are taken into account by the generalized forces due to strain energy and inertia. The minimization of the virtual work due to these forces and the prescribed external loads yields an infinite system of coupled, second order, ordinary differential equations. The truncated system can then be integrated by standard methods. Finally, it is explained how the resulting formulation can be used to solve the related problems including static response, natural frequencies determination, elastic stability, vibrations and fluid-structure interaction problems. Author (TAB)

N70-29706# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.

AN INVERSE FORM OF RAMBERG-OSGOOD FORMULA

G. Venkateswara Rao and A. V. Krishna Murty Mar. 1969 9 p ref
(AE-239-S) Avail: CFSTI

A method proposed by Ramberg and Osgood for obtaining an expression for strain in terms of stress from the experimental stress-strain curve is considered. The formula permits calculation of stress directly from strain and leads to certain simplifications in the derivation of element stiffness matrix in finite element analysis of structures made of non-Hookean materials. An adaption of the Ramberg-Osgood formula is considered for derivation of the expression for stress as a function of strain. Author

N70-29707# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.

NOTES OF A GRADUATE SEMINAR SERIES ON OPTIMUM DESIGN

G. I. N. Rozvany (Monash Univ.) Jan. 1969 28 p refs
(AE-237-S) Avail: CFSTI

Various optimization techniques and their applications to structural design analysis are reviewed. The basic concepts of concave programming are outlined and are extended to certain non-classical variational problems. The proposed approach is applied to ideal-plastic and prestressed elastic systems. Author

N70-29708# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.

STABILITY ANALYSIS OF COLUMNS USING FINITE ELEMENTS

A. V. Krishna Murty and G. Venkateswara Rao Mar. 1969 13 p refs
(AE-238-S) Avail: CFSTI

Studies on the stability analysis of columns using the finite element method are presented. Employing linear and parabolic elements, critical loads of uniform and tapered columns are obtained. The data are in good agreement with results available in literature. Author

N70-29709# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.

NUMERICAL VALUES OF INTEGRALS OF BEAM

CHARACTERISTIC FUNCTIONS

S. Durvasula, P. Bhatia, and P. S. Nair Mar. 1969 29 p refs
(AE-220-S) Avail: CFSTI

Commonly occurring integrals of beam functions with the usual boundary conditions are evaluated and presented systematically in the form of tables. The tables were calculated, compiled, and then recalculated completely to avoid numerical errors as far as possible. The material presented includes the characteristic functions for five types of beams. D.L.G.

N70-29728# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.

DEVELOPMENT AND EVALUATION OF A TRIANGULAR THIN SHELL ELEMENT BASED UPON THE HYBRID ASSUMED STRESS MODEL

Michio Tanaka Dec. 1969 122 p refs
(Contract F04694-67-C-0039)
(AD-702444; ASRL-TR-146-8; SAMSO-TR-70-19) Avail: CFSTI CSCL 16/3

A finite-element formulation for a general triangular thin doubly-curved Kirchhoff shell element has been carried out, based upon the hybrid assumed stress variational model. This formulation is then applied specifically to conical (and cylindrical) shells, and the associated finite-element properties are evaluated. Several example static problems involving isotropic cylindrical shells and an isotropic conical shell subjected to mechanical loading are solved by employing the present triangular element to evaluate this formulation; good agreement with independent reliable solutions for these problems has been found. The formulation presented, however, also includes skew orthotropic plane stress shells, variable thickness shells, and thermal loads, all for linear elastic behavior. Author (TAB)

N70-29757# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.

A GENERAL THEORY OF VIBRATIONS OF THIN TUBES

S. Suryanarayan, A. V. Krishna Murty, and C. V. Joga Rao Oct. 1968 48 p refs
(AE-235-S) Avail: CFSTI

A theory of vibration of tubes of arbitrary cross section varying arbitrarily along their axes is proposed. This is based on the assumption that the cross sections of the tube are prevented from deforming in their own planes by a system of closely spaced, rigid and massless diaphragms. The governing equations are obtained as four partial integro-differential equations with variable coefficients. Governing equations for the cases of small and very small variations of the cross section and for uncoupled flexural and torsional vibrations of doubly symmetric tubes are deduced. A method of solution is suggested. Author

N70-29760*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EVALUATION OF A FINITE-ELEMENT ANALYSIS FOR LONGITUDINAL VIBRATIONS OF LIQUID PROPELLANT LAUNCH VEHICLES

Larry D. Pinson Washington Jun. 1970 58 p refs
(NASA-TN-D-5803; L-5385) Avail: CFSTI CSCL 20K

The evaluation is performed by comparison of results from the application of the analysis to a multistage liquid propellant launch vehicle model with experimentally determined resonant frequencies and deflection shapes and with results from a spring-mass analysis. A description of some of the problems encountered in this application and their solutions are presented. The methods used in preparation of the input for the associated computer program are also described. Author

N70-29766*# Techtran Corp., Glen Burnie, Md.

DETERMINING THE THERMOELASTIC STATE OF A CYLINDRICAL SHELL [OB OPREDELENII TERMOYUPRUGOGO SOSTOYANIYA TSILINDRICHESKOY OBOLOCHKI]

L. P. Besedine Washington NASA Jun. 1970 10 p refs
Transl. into ENGLISH from Prikl. Mekh. (Ukrania), v. 5, no. 3, 1969 p 31–35
(Contract NASw-2037)
(NASA-TT-F-12944) Avail: CFSTI CSCL 20K

A long, circular cylindrical shell, unloaded at the ends is examined under the influence of an axially symmetric temperature field. It was found that allowance for the dependence between the elastic modulus and temperature reduces the level of maximum stresses and moments by 10 and 13.3% in comparison with corresponding values computed with a maximum elastic modulus. Author

N70-29775*# Techtran Corp., Glen Burnie, Md.

THE ELASTIC-PLASTIC AXISYMMETRICAL STATE OF SHELLS OF REVOLUTION OF VARIABLE THICKNESS

I. S. Chernyshenko Washington NASA Jun. 1970 10 p refs
Transl. into ENGLISH from Prikl. Mekh. (Kiev), v. 5, no. 3, 1969 p 43–48
(Contract NASw-2037)
(NASA-TT-F-12994) Avail: CFSTI CSCL 20K

Axially symmetric deformations of a thin shell of revolution of variable thickness, whose middle surface is related to a system of orthogonal curvilinear coordinates, are examined. A system of equations is derived for describing this case and the system is integrated by Il'yushin's elastic solution method. The finite-differences method is applied in solving the elastic-plastic problem in each successive approximation; in each approximation this involves solving a linear system of algebraic equations. A specific example of such a solution of the elastic-plastic problem for a shell of revolution of variable thickness is given. Author

N70-29776*# Techtran Corp., Glen Burnie, Md.

VIBRATIONS OF A CIRCULAR CYLINDER WHICH VARIES IN THICKNESS WITH TIME [KOLEBANIYA KRUGOVOGO TSILINDRA, TOLSHCHINA KOTOROGO IZMENYAETSYA VO VREMENI]

N. I. Karpov et al Washington NASA Jun. 1970 13 p refs
Transl. into ENGLISH from Prikl. Mekh. (Kiev), v. 5, no. 3, 1969 p 77–84
(Contract NASw-2037)
(NASA-TT-F-12997) Avail: CFSTI CSCL 20K

Vibrations of a cylinder with a thickness varying in time have been examined in a number of earlier studies, but the authors employed different simplifying assumptions, such as assuming that the length of the cylinder is infinitely great or that axial symmetry exists. Accordingly, only a plane-strained state of the cylinder was investigated. It is demonstrated that with a change in cylinder thickness new and interesting phenomena arise which accompany the vibration process. For example, the process of vibration of a cylinder to its total disappearance occurs in the form of three types of waves. One of them is a direct wave, the second a reflected wave, and the third a doubly reflected wave. Author

N70-29777*# Techtran Corp., Glen Burnie, Md.

STABILITY OF ORTHOTROPIC CYLINDRICAL SHELLS ALLOWING FOR THE MOMENTUM OF THE SUBCRITICAL STATE [USTOICHVOST ORTOTROPNYKH TSILINDRICHESKIKH

G. D. Gavrilenko et al Washington Jun. 1970 11 p refs Transl. into ENGLISH from Prikl. Mekh. (USSR), v. 5, no. 3, 1969 p 36–42
(Contract NASw-2037)
(NASA-TT-F-12990) Avail: CFSTI CSCL 20K

The effect of boundary conditions on the magnitude of critical forces has been examined in earlier studies and the case of an axially symmetric stability loss has been investigated; other authors have taken into account the subcritical form of shells when determining the magnitude of critical loads by examining only isotropic shells. It is demonstrated that allowance for the moment of the subcritical state makes possible a more precise determination of the upper critical load. Author

N70-29780# National Aerospace Lab., Amsterdam (Netherlands).
BUCKLING OF ORTHOTROPIC CORE SANDWICH PANELS UNDER BIAXIAL LOADING
G. Bartelds Dec. 1967 30 p refs Submitted for publication
(NLR-TR-S-660) Avail: CFSTI

Exact buckling loads and interaction curves are derived for orthotropic sandwich plates with two clamped and two simply supported edges. Comparison of the results for the special case of core isotropy with previous approximate results reveals good agreement in most cases. Similar conformance is obtained for the general results when compared with an approximate solution for orthotropic panels also presented in this report. A computer routine for automatic generation of exact interaction curves is outlined. For many practical applications the use of approximate results for biaxial loading in conjunction with exact solutions for uniaxial loading cases appears to be promising. Author

N70-29790# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
TRANSTABILITY FLUTTER ANALYSIS OF SIMPLY SUPPORTED SKEW PANELS
S. Durvasula and E. S. Nair Aug. 1969 35 p refs
(AE-252-S) Avail: CFSTI

The transtability flutter problem of simply supported parallelogrammic panels was formulated using double Fourier sine series for deflection and the Rayleigh-Ritz method. The in-plane stresses are represented in terms of oblique components. The lateral load acting on the panel is estimated by employing the two-dimensional static aerodynamic theory. The critical values of the dynamic pressure parameter are obtained for various skew angles in the case of rhombic panels under uniform compression (oblique component) along the two opposite edges. Approximate values of these parameters when the panel is under uniform oblique shear are also presented in the form of a table. Author

N70-29794*# Brown Engineering Co., Inc., Huntsville, Ala. Space and Engineering Group.
A STUDY OF SPALLATION RESULTING FROM HYPERVELOCITY IMPACT-GENERATED WAVES
T. S. Fu Apr. 1970 31 p refs
(Contract NAS8-20166)
(NASA-CR-102697; SE-292) Avail: CFSTI CSCL 20K

A study of spallation produced by the reflected stress wave due to hypervelocity impact is presented. Emphasis is placed on the matching of the solutions in hydrodynamic and elastic regimes. Hydrodynamic shock solutions are utilized as the initial condition for the elastic wave pattern. A sample calculation of the spall fracture is made in this study. Even though no direct comparison with experiments is possible, the qualitative features are compatible with available experimental observations. Author

N70-29855# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
BOUNDS FOR POISSON'S RATIOS OF ORTHOTROPIC MATERIALS
K. Vijayaknmar and Akella Kameswara Rao Mar. 1969 19 p refs
(AE-153-S) Avail: CFSTI

The limitations on variations of elastic constants in orthotropic materials were investigated. Bounds for Poisson's ratios of an orthotropic material in relation to its Youngs moduli were considered. This was achieved by applying the well-known energy and volume criteria which states that: (1) the strain energy density function, in terms of stresses of a given material is positive for an arbitrary stress system; and (2) the first order change in volume of an element of a given medium is positive for an arbitrary tensile stress system. Author

N70-29857# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
DISCRETE-ELEMENT MODELING AND SENSITIVITY STUDIES OF STATICALLY-LOADED SINGLE-LAYER AND BONDED DOUBLE-LAYER THIN SHELLS OF REVOLUTION
Raffi P. Yeghiayan, Emmett A. Witmer, and Susan B. French Jan. 1970 253 p refs
(Contract F04694-67-C-0039)
(AD-702445; ASRL-TR-146-11; SAMSO-TR-70-46) Avail: CFSTI CSCL 16/3

The discrete-element static structural analysis program SABOR 5 has been applied to analyze several structural configurations consisting of single-layer and/or bonded double-layer shell-of-revolution structures. This experience resulted in various improvements to the SABOR 5 program. The effects on SABOR 5 predictions of the structural behavior of typical configurations, resulting from choosing a variety of alternate plausible discrete-element modelings, particularly for structural-joint and/or constraint regions of the structure where several adjacent layers exist, is investigated and illustrated. Also studied is the sensitivity of the predicted behavior of statically-loaded typical shell configurations to various types of simplified structural discrete-element modelings and support-point modelings, selected structural thickening near support points, variations in material properties of isotropic shell layers and bonds and/or of orthotropic shell layers, and skew orientation of orthotropic shell-layer material, all in the context of applying the SABOR 5 program. Author (TAB)

N70-29879# Aeronautical Research Labs., Melbourne (Australia).
RESIDUAL STRENGTH TESTS ON DOVE CENTRE SECTION TENSION BOOMS
R. Ellis and D. G. Graff Oct. 1969 27 p refs
(ARL/SM-345) Avail: CFSTI

During fatigue tests on D.H. 104 Dove wings, fatigue cracks were initiated in a number of the center section tension booms made from D.T.D. 363 aluminum alloy. Residual strength tests were carried out on the cracked booms by loading statically to failure. The failing load was predicted from measurements of the initial crack damage in each boom. However, the agreement with the experimentally determined values was not good, and a method was then developed which allowed for the eccentricity of the applied load on the cracked section. The residual strength predicted by this method showed closer agreement with the experimental results. Author

N70-29884# IIT Research Inst., Chicago, Ill. Dept. of Mechanics.
MINIMUM WEIGHT DESIGN OF STRUCTURES Final Report, 1 Feb. 1964 – 31 Jan. 1970
George J. Megarefs 1970 26 p refs
(Contract DA-31-124-ARO(D)-185)
(AD-701924; AROD-4551-12-E) Avail: CFSTI CSCL 13/13

An approach originally used to reveal the highly singular nature of the problem of minimum weight design has been developed, in various ways, into self contained powerful methods which proved capable of solving much more complicated problems than had been attacked prior to 1964. The essence of the method lies in the possibility of expressing the weight to be minimized as a functional, over the whole structure, of the relevant generalized stresses. The stresses which minimize it are called minimal and are found by some variational process, either classical or novel. The method has been named statical because it uses only statical considerations, in contrast to that of constant energy dissipation in which kinematical considerations are also required. The statical method has by now been adapted and applied to the rigorous solution and the exhaustive investigation of minimum volume design problems in beam structures, plates and shells. Its contributions to the advancement in this field are listed. All problems mentioned are completely solved, even if they have not yet been submitted for publication or written up in the form of papers. Author (TAB)

N70-29911*# Translation Consultants, Ltd., Arlington, Va.

INVESTIGATION OF VIBRATIONS OF A CYLINDRICAL SHELL CONTAINING A LIQUID

V. S. Pavlovskiy et al Washington NASA Jun. 1970 15 p refs Transl. into ENGLISH from Prikl. Mekh. (Kiev), v. 5, no. 6, 1969 p 27 – 36
(Contract NASw-2038)
(NASA-TT-F-12959) Avail: CFSTI CSCL 20K

The results of the theoretical investigations of the nonaxisymmetrical vibrations of a cylindrical shell with a plastic bottom partly filled with a liquid are presented. Each major aspect of the effects of the liquid on the shell is mathematically studied. The differential equations of motion of a shell containing a liquid are derived and conclusions and graphs for different shell conditions are shown. The graphs show that system frequency values decrease with an increase in the level of liquid in the shell. The greatest drop in frequencies is observed at a low fill level up to a certain point after which the frequency drops more slowly. Author

N70-29923*# Translation Consultants, Ltd., Arlington, Va.

DETERMINING THE CHARACTERISTICS OF NONLINEAR ELEMENTS OF VIBRATION SYSTEMS FROM MOTION ANALYSIS [OPREDELENIYE KHARAKTERISTIK NELINEYNYKH ELEMENTOV KOLEBATELNYKH SISTEM IZ ANALIZA DVIZHENIYA]

V. O. Kononenko et al Washington NASA Jun. 1970 12 p refs Transl. into ENGLISH from Prikl. Mekh. (Kiev), v. 5, no. 10, 1969 p 1 – 7
(Contract NASw-2038)
(NASA-TT-F-12962) Avail: CFSTI CSCL 20K

A mathematical method is proposed for use in researching the nonlinear elements of real vibrating systems of a variety of different physical natures. The methodology is used to determine the characteristics of the nonlinear elements (the nonlinear restoring force and the nonlinear attenuation) of vibrating systems by analysis and special processing of information concerning a real system (based on the theory of the properties of quasi-linear vibrating systems). The purpose of this stage of research is to develop a methodology for studying the motion of a nonlinear vibrating system with one degree of freedom subjected to an external excitation force of known characteristics. Author

N70-29930# North American Rockwell Corp., Downey, Calif. Space Div.

APPLICATION OF MULTIPARAMETER FLIGHT LOADS DATA TO STRUCTURAL DESIGN CRITERIA. VOLUME 1: ANALYSIS Final Technical Report, Jan. 1966 – Jul. 1968

D. J. Trent, A. E. Cowen, and Innes Bouton Mar. 1969 71 p refs
(Contract AF 33(615)-3448)
(AD-850930; SD-68-627-1; AFFDL-TR-68-131-Vol-1) Avail: CFSTI CSCL 1/3

A research study is described to test the applicability of prescribed methods of analysis of multiparameter flight loads data to structural design criteria, and to present in statistical format the data that are available. Six computer programs are described. These programs reduce, analyze and present in graphical and tabular form statistical distributions of the data. An automatic warning system is developed which can be used for continuous monitoring of operational data and comparison with design criteria. Procedures used in data reduction, peak discrimination and statistical analysis of the data are described. A procedure is outlined for automatic separation of gust from maneuver data. Mathematical formulation of the automatic warning system is presented. Load transfer functions used in the automatic warning system are developed. Author

N70-29941# California Univ., Livermore. Lawrence Radiation Lab.

NONLINEAR DYNAMICS OF SOLIDS BY FINITE ELEMENT METHODS

Mark Hartzman (Ph.D. Thesis) 19 Dec. 1969 101 p refs
(UCRL-50779) Avail: CFSTI

A method for analyzing the nonlinear dynamic response of deformable solids, subjected to time and space dependent thermal and mechanical loads, is developed. The nonlinearities considered are due to the nonlinear character of the strain displacement relations and the equations of motion, and to the nonlinear constitutive relations which describe the physical behavior of the material. Elastic-plastic relations of the incremental (Prandtl-Reuss) type were chosen for material description. A displacement type finite element method is applied to reduce the governing partial differential equations to a set of simultaneous nonlinear ordinary differential equations of motion of a lumped mass system connected by three -Dimensional elements. The analysis is applied to two plane wave propagation problems and two large deformation problems of shells and beam under blast loading. Comparison of analytical or experimental results with numerical calculations indicates good agreement. Author (NSA)

N70-29967# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.

BUCKLING OF CLAMPED ISOTROPIC PARALLELOGRAMMIC PLATES

S. Durvasula Apr. 1969 37 p refs
(AE-245-S) Avail: CFSTI

The problems are considered under combined loads. Approximate solutions are obtained by the Galerkin method employing beam characteristic functions of a clamped-clamped beam. Numerical calculations of the buckling coefficients were made for a few side ratios and skew angles of the plate under the action of direct and shear stresses individually and a few typical combined loadings. Convergence studies were made for a few representative configurations. Results for several new plate configurations and loading conditions as well as more accurate results for some configurations previously reported are obtained. In general, for a given side-ratio the critical values increase with the skew angle. The use of bar buckling eigen functions for the solution of plate buckling problems is recommended. Author

N70-30000*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

STRUCTURAL EFFICIENCY OF ALUMINUM MULTIWEB BEAMS AND Z-STIFFENED PANELS REINFORCED WITH FILAMENTARY BORON-EPOXY COMPOSITE

James P. Peterson Washington Jun. 1970 27 p refs
(NASA-TN-D-5856; L-7022) Avail: CFSTI CSCL 13M

The gain in structural efficiency achieved by reinforcing the aluminum cover skins of multiweb beams and Z-stiffened panels with rectangular boron-epoxy stiffeners located midway between conventional webs or stiffeners is calculated. The effectiveness of adding boron-epoxy reinforcement to the outstanding flange of the Z-stiffeners in Z-stiffened panels is also evaluated. Cover reinforcement reduces the mass of the multiweb beams by about 25 percent and the mass of Z-stiffened panels by about 15 percent. The flange reinforcement reduces the mass of the Z-stiffened panels by another 8 percent at low values of the loading index but has little effect on mass at higher values of the loading index. Author

N70-30033*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

APPLICATION OF ANALYSIS AND MODELS TO STRUCTURAL DYNAMIC PROBLEMS RELATED TO THE APOLLO-SATURN 5 LAUNCH VEHICLE

Sumner A. Leadbetter, comp. Washington Jun. 1970 106 p refs
(NASA-TN-D-5831; L-6595) Avail: CFSTI CSCL 22B

Integrated analytical and experimental investigations were conducted of potential structural dynamic problems that could contribute to structural malfunctions in the payload section of a launch vehicle. Studies were conducted in support of extensive investigations of an unmanned Apollo-Saturn 502 structural anomaly and results are presented which: (1) define the dynamic-response characteristics of components of a model spacecraft; (2) evaluate involved analytical procedures; (3) compare the dynamic behavior of a partial vehicle with that of a full vehicle; and verify the ability of the model spacecraft sandwich structure to withstand a potential failure mode. D.G.

N70-30042# National Aerospace Lab., Tokyo (Japan).

EXPERIMENTAL INVESTIGATION OF STRENGTH OF AXIAL FLOW COMPRESSOR BLADE ROOT: PIN JOINT LUG HAVING CLEARANCE BETWEEN PIN AND PIN HOLE

Tameji Ikeda and Takashi Yamagishi 1969 26 p refs In JAPANESE; ENGLISH summary
(NAL-TR-183) Avail: CFSTI

Static tension tests of a single lug large-size model of pin joint made from 17S-T3 aluminum alloy were carried out varying the clearance between the pin and pin hole. The stress distribution over the lug and the contact area between the pin and pin hole were measured. Destructive tests of practical multi-lug pin joint models made from 17S-T3 aluminum alloy and SCM-3 chrome-molybdenum steel were carried out. The tests show that (1) The stress concentrations of the lug depend on the magnitude of load and the clearance between pin and pin hole, and those effects are remarkable in the case of small clearances; (2) The stress concentration factors on a square head lug are from 8 to 10 per cent smaller than those of a round head lug in the pin hole boundary, but those are reversed in the lug tip; (3) As the clearance decreases, the contact area between the pin and the pin hole becomes larger than that calculated from the Hertz-Contact formula. (4) The strengths of practical lug models are from 70 to 80 per cent of the tensile strength of the material. Author

N70-30044# Indian Inst. of Science, Bangalore (India). Dept. of Aeronautical Engineering.

FLUTTER ANALYSIS OF TWO-DIMENSIONAL CLAMPED PANELS USING POLYNOMIAL APPROXIMATION

S. Durvasula and I. Chopra Apr. 1969 35 p refs
(AE-243S) Avail: CFSTI

The utility of polynomial approximation in the analysis of panel flutter problem is investigated. In particular, the problem of a two-dimensional clamped panel is examined in detail. For the aerodynamic loading, the two-dimensional statis approximation is used. The stability boundary showing the variation of dynamic pressure with inplane direct stress, obtained by the modal solution is presented and compared with the available exact solution. Using these functions, the static stability boundary is also obtained. The convergence is found to be quite rapid and the agreement with the exact solution is very good indeed. The extension of the use of this polynomial approximation to rectangular clamped panels is also discussed. Author

N70-30045 Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).

PREVENTIVE MAINTENANCE TECHNIQUES BASED ON THE VIBRATION SPECTRUM OF MACHINERY [TECHNICAS DE MANUTENCAO PREVENTIVA PELO ESPECTRO DAS VIBRACOES]

L. X. Nepomucene and L. F. B. Delbone 22 Sep. 1969 9 p refs In Portuguese Submitted for publication
(TR-6910/E-018) Avail: CFSTI

The fundamentals of vibration techniques as applied to fatigue and failure prevention in machinery and equipment are presented. In addition to the basic theory, practical cases that permit the establishment of preventive maintenance programs are given with the effects on the costs and productivity of the enterprise. The work is based on studies whose purpose was the establishment of preventive maintenance programs in industry that provide for maximum operating life of the equipment, at the necessary level for efficient production. Author

N70-30053# Aerospace Corp., San Bernardino, Calif.

BUCKLING OF CIRCULAR CYLINDRICAL SHELLS WITH DIFFERENT MODULI IN TENSION AND COMPRESSION Technical Report, Jul. Dec. 1969

Robert M. Jones 31 Dec. 1969 65 p refs
(Contract F04701-69-C-0066)
(AD-701060; TR-0066(S5816-70)-1; SAMSO-TR-70-55) Avail: CFSTI CSCL 20/N

An exact solution is derived for buckling of circular cylindrical shells with different elastic moduli in tension and compression under arbitrary combinations of axial and lateral pressure. The combinations include those in which one component of pressure causes tension. Classical buckling theory, by which is implied a membrane prebuckled shape, is used for simply supported edge boundary conditions. General results in a form analogous to Batdorfs classical k-Z form are presented for several ratios of tensile to compressive elastic moduli. Differences in tensile and compressive moduli are observed to cause significant differences in the buckling loads. This situation is particularly acute when only a small tensile loading component exists in conjunction with an apparently dominant compressive loading component. For example, if a small axial tensile loading is present in a principally external pressure loading environment, a reduction of 37 percent in the external pressure buckling load from the zero axial load case can occur for a tensile modulus that is half the compressive modulus. The present results are important because current composite materials often have significantly different elastic moduli in tension and compression. Author (TAB)

N70-30063# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SOME CASES OF THE ELASTIC EQUILIBRIUM OF AN ANISOTROPIC PLATE WITH A NONCIRCULAR OPENING: PLANE PROBLEM

S. G. Lekhnitskii 3 Oct. 1969 41 p refs Transl. into ENGLISH from Inzh. Sb. (Moscow), v. 22, 1955 p 160 187
(AD-700405; FTD-HT-23-366-69) Avail: CFSTI CSCL 20/11

Approximate solutions are given of a plane problem for an anisotropic plate with an opening close to an equilateral triangle with rounded corners and to a rectangle with twisted short sides, whereby expansion or bending by moments is discussed a general case of the distribution of external forces as well as special cases. Some general formulas which are used in finding approximate solutions for a plate with an opening are given preliminarily. Author (TAB)

N70-30075# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MECHANICS OF SOLIDS: SELECTED ARTICLES [MEKHANIKA TVERDOGO TELA]

G. I. Bykovtsev et al 14 Nov. 1968 25 p refs Transl. into ENGLISH from Inzh. Zh. (Moscow), no. 3, 1967 13 p
(AD-683954; FTD-HT-23-751-68) Avail: CFSTI CSCL 20/11

Contents: Wave propagation in three-dimensional elastoplastic bodies for total plasticity; Numerical solution of the large-deflection problem for the corrugated diaphragm. TAB

N70-30128# Southampton Univ. (England). Inst. of Sound and Vibration Research.

AN APPROXIMATE SOLUTION FOR THE NATURAL FREQUENCIES OF CYLINDRICALLY CURVED RECTANGULAR SHELLS WITH IN-PLANE LOADS

Edmond Szechenyi Apr. 1970 23 p refs
(ISVR-TR-29) Avail: CFSTI

The natural frequencies of cylindrically curved shells are determined for both clamped and simply supported edges by a partially empirical method. The final solution is presented as a formula and two sets of curves which together will give the natural frequencies for any shell with or without in-plane stresses. The accuracy of this very simple solution has been checked against accurate results by other authors and proves to be very good. Author (ESRO)

N70-30144# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PROPAGATION OF SEISMIC WAVES IN A STRATUM AND THEIR INTERACTION WITH A STRUCTURE

A. P. Sinitsyn 2 Dec. 1969 16 p refs Transl. into ENGLISH from Byull. po. Inzh. Seismologii (USSR), no. 5, 1966 p 45–56 Presented at Seismology Council Session of USSR Acad. of Sci., Ashkhabad, 12 Nov. 1964
(AD-702950; FTD-HT-23-286-69) Avail: CFSTI CSCL 13/13

The author examines the conditions of propagation of longitudinal seismic waves through a layer, considering the possible effect of such waves on man-made structures, particularly gravity dams. Several models for the layer and various boundary conditions are studied, and equations are derived to express the stress states in the layer. Plastic waves as well as elastic waves are considered. Gravity of different dimensions and geometry are assumed in seeking quantitative evaluation of the effects of seismic waves. Use of the formulas permits one to study the stress state of the layer along which longitudinal waves pass even when the physical characteristics of the layer and the conditions at the boundaries are complex. Interaction of the waves with man-made structures may be evaluated quantitatively. Precision of computation depends on the model used, and this precision may be improved if one is willing to increase the volume of computations. Examples support the view that the results may be used for engineering calculations, though they are still preliminary and represent approximations rather than final solutions. Author (TAB)

N70-30153*# Texas A&M Univ., College Station. Aerospace Engineering Dept.

NONLINEAR DYNAMIC ANALYSIS OF SHELLS OF REVOLUTION BY MATRIX DISPLACEMENT METHOD

J. A. Stricklin, J. E. Martinez, J. R. Tillerson, J. H. Hong, and W. E. Haisler Feb. 1970 103 p refs
(Grant NGL-44-001-044)
(NASA-CR-110406; Rept-69-77) Avail: CFSTI CSCL 20K

A formulation and computer program is developed for the geometrically nonlinear dynamic analysis of shells of revolution under symmetric and asymmetric loads. The nonlinear strain energy expression is evaluated using linear functions for all displacements. Five different procedures are examined for solving the equations of equilibrium with Houbolt's method proving to be the most suitable. Solutions are presented for the symmetrical and asymmetrical buckling of shallow caps under step pressure loadings and a wide variety of other problems including some highly nonlinear ones. Author

N70-30158*# Techtran Corp., Glen Burnie, Md.

AXIALLY SYMMETRIC THERMOELASTIC VIBRATIONS OF A CYLINDRICAL SHELL [OCESIMMETRICHNYE TERMOUPRGIYE KOLEBANIYA TSILINDRICHESKOY OBOLOCHKI]

R. N. Shvets Washington NASA Jun. 1970 13 p refs Transl. into ENGLISH from Prikl. Mekh. (Kiev), v. 5, no. 3, 1969 p 23–30
(Contract NASw-2037)
(NASA-TT-F-12933) Avail: CFSTI CSCL 20K

A study of the effect of thermoelastic scattering on axially symmetric vibrations of infinite and finite freely supported cylindrical shells is reported. Particular attention is given to the effect of thermoelastic scattering on the propagation of plane waves in an infinitely long cylindrical shell. Two types of vibrations are examined. The dependence of dimensionless phase velocity on dimensionless frequency is determined for both elastic and thermoelastic shells; many other parameters for those two varieties of shells are examined. Author

N70-30159*# Scientific Translation Service, Santa Barbara, Calif.

A STUDY OF THE UNSTEADY PRESSURE DISTRIBUTION ON A TWO-DIMENSIONAL WING WITH OSCILLATING CONTROL SURFACE IN THE NEAR-SONIC SPEED RANGE [EINE STUDIE DER NICHTSTATIONAEREN DRUCKVERTEILUNG AN EINEM ZWEIDIMENSIONALEN FLUEGEL MIT SCHWINGGENDEM RUDER IN SCHALLNAHEN BEREICH]

R. J. Zwaan Washington NASA Jun. 1970 12 p refs Transl. into ENGLISH from DGLR Fachbuchreihe (Brunswick), v. 3, 1969 p 34 1–34 13
(Contract NASw-2035)
(NASA-TT-F-13087) Avail: CFSTI CSCL 20K

A two-dimensional wing model with a harmonically oscillating control surface is investigated at near-sonic speed range. The aerodynamic moment was calculated according to the method of Eckhaus. Author

N70-30160*# Rochester Applied Science Associates, Inc., N.Y.

A METHOD FOR DETERMINING THE CHARACTERISTIC FUNCTIONS ASSOCIATED WITH THE AEROELASTIC INSTABILITIES OF HELICOPTER ROTORS IN FORWARD FLIGHT

Vincent J. Piarulli and Richard P. White, Jr. Washington NASA Jun. 1970 75 p refs
(Contract NAS1-9261)
(NASA-CR-1577; Rept-69-10) Avail: CFSTI CSCL 20K

A method has been developed for determining the characteristic functions (modal content) of aeroelastic instabilities experienced by helicopter rotors in forward flight. The method assumes a knowledge of the characteristic values which characterize the frequency and growth rate of an unstable mode of a helicopter rotor in a given flight condition. Characteristic values may be found from the previously developed program which is capable of analyzing a coupled set of linear, second-order differential equations with periodically varying coefficients. The necessary formulation was programed for the case of a system with three degrees of freedom. Calculations were carried out for comparison with available experimental data. Author

N70-30170# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

TRANSACTIONS OF THE AVIATION INSTITUTE, KAZAN (SELECTED ARTICLES)

S. Kh. Gainullina et al 12 Nov. 1968 24 p refs Transl. into ENGLISH from Tr. Aviats. Inst. (USSR), no. 91, 1966 p 69–77, 148–156
(AD-683948; FTD-HT-23-623-68) Avail: CFSTI CSCL 13/13

Contents: Use of variational methods for the design of minimum-weight systems, and Propagation of fatigue cracks in statically indeterminate rod structures. Author (TAB)

N70-30181# National Aerospace Lab., Tokyo (Japan).

ON THE NATURAL VIBRATION OF PLATES RESTRAINED AT SEVERAL POINTS

Taketoshi Hanawa, Yasuo Tada, Hideo Izumi, and Shinichi Koshide Sep. 1969 42 p refs In JAPANESE; ENGLISH summary
(NAL-TR-182) Avail: CFSTI

The method of solution is based upon the Rayleigh-Ritz procedure, and the restraints at the points are added to a basic functional making use of the method of Lagrange multipliers. The deflection of a given plate is expressed by a general power series of variables x and y so that the used function is not only applicable for a plate with arbitrary shape but also suitable for numerical calculations with a digital computer. It is found that the change of restraint conditions at the points does not require a new derivation of the basic characteristic equation but only introduces supplemental elements to the original equation. Furthermore, the corresponding values of these elements concerned with restraint conditions can be easily obtained by simple alternation in the program of digital computer or by desk calculations. A few examples of numerical analysis as well as of experimental results are shown, and they indicate the applicability of this method to the kind of the problems studied. Author

N70-30183# Aeronautical Research Labs., Melbourne (Australia).

EFFICIENT COMPUTATION IN MATRIX FORCE METHODS OF THE COMBINED EFFECTS OF CUTOUTS AND MODIFICATIONS

D. G. Ford Jun. 1969 20 p refs
(ARL/SM-341) Avail: CFSTI

The Crout elimination scheme, based on triangular factorisation, has been modified to allow efficient solution of the equations in the matrix force method arising from the combined effects of cutouts and modifications. Equations arising from direct substitution require inversion of the matrix of flexibility changes which is inconvenient in applications to fatigue cracks or fracture. The modified method avoids this. Author

N70-30198*# Litton Systems, Inc., Beverly Hills, Calif. Applied Technology Div.

FABRICATION OF A COMPARTMENTED SPHERICAL GAS BAG LANDING SYSTEM Final Report

Apr. 1970 32 p refs
(Contract NAS1-7968)
(NASA-CR-66944; Publ-11-70-605) Avail: CFSTI CSCL 13M

The objective of this program was the development, fabrication, and static-proof testing of a compartmented spherical gas bag for use in experimentally evaluating the capabilities of such a system as an omnidirectional landing system. The high pressure requirement for such a system necessitated an investigation of fabrication techniques since existing techniques were inadequate. A six-foot diameter, compartmented spherical gas bag was fabricated and the fabrication technique is described. Author

N70-30243# Southampton Univ. (England.) Inst. of Sound and Vibration Research.

PROPAGATION OF FLEXURAL WAVES IN INFINITE, DAMPED RIB-SKIN STRUCTURES Technical Report, 1 Jun. - 31 Dec. 1968

Denys J. Mead and Gautam Sen Gupta Jan. 1970 53 p refs
(Contract F61052-68-C-0027)
(AD-702540; ISVR-M-303; AFML-TR-70-13) Avail: CFSTI CSCL 1/3

Equations for the propagation constants of free flexural waves in rib-skin type structures are first developed in terms of the edge receptance of the ribs and skin elements. It is shown that two complex propagation constants exist for each frequency, and corresponding to each of these is a distinct natural wave of flexural motion in the skins. A particular rib-skin structure with thin ribs is then studied in detail, and the variation of the propagation constants with frequency is observed. Free, unattenuated propagation of the waves is only possible in certain frequency ranges which, for each of the two natural waves, may overlap. The influence of the ribs on these ranges is investigated. Author (TAB)

N70-30281# Shock and Vibration Information Center (Defense), Washington, D.C.

THE SHOCK AND VIBRATION BULLETIN

Nov. 1968 345 p refs Proceedings of the 38th Symp. on Shock Vibration and Associated Environments, St. Louis, 1-2 May 1968
(AD-683314; NRL-Bull-38-Pt-3) Avail: CFSTI CSCL 20/11

The document continues the analysis of a foregoing report on stress and vibration of space, air marine, and ground structures. TAB

N70-30342# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.

BUCKLING OF THIN PLATES BY CONTINUOUSLY DISTRIBUTED DISLOCATIONS

N. Y. Oelcer and T. Mura [1970] 15 p refs Supported by AEC
(COO-2034-3) Avail: CFSTI

The buckling of thin plates due to distributions of edge dislocations is discussed. The buckling criterion is calculated in terms of the average distance between dislocations whose direction is normal to the plate surface. A thin plate does not buckle when the average distance is larger than b(l/t) squared, provided the dislocations are distributed along straight lines, t being the thickness of the plate, b the Burgers vector, and l a characteristic length of the plate. The result will be significant for dislocation observations by electromicroscopes. Author

N70-30379*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AN ANALYTICAL AND EXPERIMENTAL STUDY OF THE INFLUENCE OF COMPONENT VISCOELASTIC SHEAR MODES ON LAUNCH VEHICLE TORSIONAL DYNAMICS

Ross L. Goble (Ph.D. Thesis—Virginia Polytech. Inst.) May 1970 130 p refs
(NASA-TM-X-62955) Avail: CFSTI CSCL 22B

The equations of motion which describe the behavior of the propellant in pure shear are derived from the theory of elasticity, with the propellant mathematically modeled as a thick-walled hollow cylinder. The resulting general solution of the governing Bessel's equation is then evaluated for free-free, free-pinned, and pinned-free boundary conditions. The frequency determinant is also established for the same boundary conditions. A correspondence principle is invoked to obtain the associated propellant frequency characteristics in the viscoelastic regime. Comparisons of system dynamic characteristics for the assumptions of elastic, viscoelastic and rigid propellant inertias are provided. Results indicate the necessity for considering propellant shear flexibility about the rotational axis of symmetry in assessing composite system dynamic response to oscillatory torsional excitations during flight. E.M.C.

N70-30383# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STABILITY AND FREE VIBRATIONS OF THIN CYLINDRICAL AND CONICAL SHELLS OF A CIRCULAR CROSS SECTION UNDER VARIOUS BOUNDARY CONDITIONS

L. G. Agenosov et al 21 Jan. 1970 15 p Transl. into ENGLISH from Issled. Po Teorii Plastin i Obolochek (USSR), no. 2, 1964 p 111-126
(AD-703013; FTD-HT-23-334-69) Avail: CFSTI CSCL 13/13

After a survey of numerous papers by other authors dealing with the stability and free vibrations of thin isotropic supported cylindrical and conical shells under various boundary conditions, the present authors come to the conclusion that the formulas so far suggested for the determination of the frequencies of vibrations of the conical shells are cumbersome, and that their applicability range is not well defined. The present paper investigates the stability and small extra-axial free vibrations of structurally orthotropic cylindrical and conical shells under the action of axial compression and external pressure under various boundary conditions: six types of clamping for the cylindrical and three types for conical shells. The inertial forces in the normal and circular directions are taken into account, and the effect of the boundary conditions on the lowest frequency of the free vibrations of the shell is studied. The results of the calculations agree within the calculation errors, with the results of other authors. Author (TAB)

N70-30385*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

MONTE CARLO ANALYSIS OF STRUCTURAL LOADS RESULTING FROM SPACE VEHICLE LIFT-OFF

Robert Douglas Schwartz (M.S. Thesis--Houston Univ.) Jun. 1970 92 p refs
(NASA-TM-X-58046) Avail: CFSTI CSCL 20K

A Monte Carlo analysis was conducted to determine a theoretical Apollo Saturn 5 launch release design bending moment at a critical location on the spacecraft structure. Inputs to the analysis were defined by their distribution functions and selected by a random number generator. Three dimensional structural dynamic characteristics of the Apollo Saturn 5 vehicle were used in a forced response program to determine the spacecraft loads for 200 cases. The results indicate that the maximum bending moment is lognormally distributed. In addition, the design bending moment was compared to one obtained using the current design method of root-sum-squaring the results of several separate cases. This investigation shows that a Monte Carlo approach to determine a lift-off design load is feasible, and that the result obtained through the current design method is conservative. Author

N70-30392*# Bellcomm, Inc., Washington, D.C.

STATISTICAL ANALYSIS OF NONSTATIONARY STRUCTURAL RESPONSE UNDER FEEDBACK CONDITIONS

I. Y. Bar-Itzhack and S. N. Hou 6 Apr. 1970 48 p refs
(Contract NASw-417)
(NASA-CR-110427; TM-70-2031-2) Avail: CFSTI CSCL 20K

A method for analyzing augmented systems of structures, controls, and other subsystems is presented. The systems have to be linear but may be time varying and under non-stationary excitation. The analysis results in equations for solving the covariance matrix of the state of the system. The state of the system is a vector which may contain translational and rotational motions of the structures as well as other variables of the system and their derivatives. Computational considerations involved in the solution of these equations are also discussed. Author

N70-30413# Illinois Univ., Urbana. Dept. of Aeronautical and Astronautical Engineering.

AN ANALYSIS OF REINFORCED FLAT PLATES Summary Report, Sep. 1966 – Jan. 1968

B. K. Donaldson (Ph.D. Thesis) Wright-Patterson AFB, Ohio AFML Nov. 1969 141 p refs
(Contract F33615-67-C-1190)
(AD-701396; AFML-TR-69-252) Avail: CFSTI CSCL 20/11

This report presents a method of analysis for the response of forced harmonic vibration of a finite structure composed of a flat plate continuous over, and rigidly attached to, a grid of open section beams. This method of analysis is one in which either the standard beam or thin plate equilibrium equations for small deflections are satisfied everywhere on the structure, yet the beam grid is allowed to have any form, the flat plate to have polygonal cutouts, and the structure as a whole to have any combination of boundary conditions. Finite Fourier series are used to represent the plate edge deflections. Therefore, the equations of continuity and the boundary conditions are only satisfied approximately. Author (TAB)

N70-30417# Naval Ordnance Lab., White Oak, Md.

A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF SNAP LOADS IN STRANDED STEEL CABLES

Jack E. Goeller 26 Nov. 1969 37 p refs
(AD-701319; NOLTR-69-215) Avail: CFSTI CSCL 13/9

During longitudinal oscillation of a cable with a payload supported at the lower end, a severe impact load called snap can be experienced if the cable should go slack. This report presents an analog model and a digital program for computing snap loads in cables during longitudinal oscillation simulating ocean wave motion. The theory is shown to agree well with experimental tests on stranded steel cable oscillated in water. Schemes for mitigating the snap load are discussed. Author (TAB)

N70-30421# Nord Avaiation, Chatillon-Sous-Bagneux (France).

STRAIN AND CRACK-OPENING MEASUREMENTS FOR THE DETERMINATION OF THE STRESS INTENSITY FACTOR AT THE TIPS OF CRACKS IN THIN SHEET MATERIALS

William Barrois and Surender Kumar Bhandari 1969 24 p refs
Presented at the 29th Meeting of the AGARD Struct. and Maters. Panel, Istanbul, 28 Sep. - 8 Oct. 1969
Avail: CFSTI

Three strain-gauge measurements ahead of the crack tip and perpendicular to the cracking plane are used to calculate the stress intensity factor that defines the crack-tip stress field in any thin sheet, stiffened or unstiffened, plane or slightly curved. A fatigue test on a cracked specimen cut from the same material yields results that permit prediction of the fatigue cracking rate in the actual structure. The possibility of extending the method to surface tracks contained in thick components is considered; as a preliminary step for the use of crack-opening displacement measurements, results of such tests for thin sheets are described. Author

N70-30447# Royal Aircraft Establishment, Farnborough (England).

THE ELASTO-RESISTIVE EFFECT IN METAL WIRES AND FILMS

H. K. P. Neubert Dec. 1969 50 p refs
(RAE-TR-69272) Copyright. Avail: CFSTI

To better understand the physics of strain gauges a critical assessment was made of models for the elastoresistive effect in metal wires and films. The validity of one model was tested by comparing computed and experimental values of the sensitivity to transverse strains. Sound values of longitudinal strain sensitivity were predicted from a few non-electrical physical constants by reference to a more fundamental atomic model based on the transport characteristics of electricity through bulk metals. An atomic model, modified to represent metal films of various thicknesses, gave realistic strain sensitivities and explained the high gauge factors observed on discontinuous metal films. Author (ESRO)

N70-30453# Royal Aircraft Establishment, Farnborough (England).

VISCO-ELASTIC LONGITUDINAL OSCILLATIONS OF A ROD WITH A MASS AT THE END [VYAZKO-UPRUGIE PRODOLNYE KOLEBANIYA STERZHNYA S MASSOI NA KONTSE]

V. A. Kuzmenko et al Jan. 1970 14 p refs Transl. into ENGLISH from Prikl. Mekh., Akad. Nauk UKR. RSR (Kiev), v. 5, no. 1, 1969 p 67 – 72
(RAE-Lib-Trans-1430) Avail: CFSTI

The response of a nonlinear single degree of freedom system to a sinusoidal input is analysed using viscoelastic relationships. The Poynting-Thompson relationship is used and nonlinearity is introduced by reducing the relaxation component of the elastic modulus as a function of increasing deformation. An asymptotic solution is derived and its first approximation reduces to a simple form which is shown to give a reasonable representation of nonlinear behavior. A similar analysis with the Kelvin-Voight relationship is shown to be unrepresentative of reality. Author

N70-30508 National Lending Library for Science and Technology, Boston Spa (England).

STRESS CONCENTRATIONS NEAR CURVILINEAR HOLES IN PLATES AND SHELLS [KONTSENTRATSIYA NAPRYAZHENIY OKOLO KRIVOLINEYNYKH OTVERSTIY V PLASTINAKH I OBOLOCHKAKH]

G. N. Savin 1969 51 p refs Transl. into ENGLISH from Kontsentratsiya Napryazenii (Kiev), Issue 1, 1965 p 5-38
(NLL-RTS-5580) Avail: Natl. Lending Library, Boston Spa, Engl.: 40s or 5 NLL photocopy coupons

The investigations of stress distribution near holes are reviewed. Among the problems and topics of these stresses discussed are: conformal mapping of the exterior of the hole, influence of material anisotropy on stress concentration, multiple connected holes, dynamic problems of stress concentration and propagation of elastic waves from holes, elastic plastic problems, reinforcement of holes by rings, shape of the hole, and Gaussian curvature. F.O.S.

N70-30569# Technische Hochschule Stuttgart (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.

APPLICATION OF MATRIX CALCULUS TO THE DYNAMIC ANALYSIS OF AIRCRAFT STRUCTURES. PART 1: VIBRATION CALCULATIONS OF THE F 104 G AIRCRAFT [ANWENDUNG DES MATRIZENKALKUELS AUF DIE DYNAMISCHE ANALYSE VON FLUGKONSTRUKTIONEN. TEIL 1: STANDSCHWINGUNGSRECHNUNGEN AM FLUGZEUG F 104 G]

H. P. Mlejnek *In* Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 113-118 In GERMAN (See N70-30551 15-34)
Avail: CFSTI

Using some 2500 construction drawings the structure of the F104 G aircraft was split into standardized elements. The vibration behavior was calculated by means of a preliminary condensation method, starting from the primary degrees of freedom of each substructure and leading to a synthesis of all condensed substructures, i.e. condensed rigidity and mass matrices. The resulting 126 × 126 dynamic matrix was analysed for eigenvalues and the results for the symmetrical fuselage flexure are discussed. ESRO

N70-30570# Technische Hochschule Stuttgart (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.

APPLICATIONS OF MATRIX CALCULUS TO THE DYNAMIC ANALYSIS OF AIRCRAFT STRUCTURES. PART 2: STATIC AND DYNAMIC CALCULATION OF HELICOPTER ROTOR BLADES [ANWENDUNG DES MATRIZENKALKUELS AUF DIE DYNAMISCHE ANALYSE VON FLUGKONSTRUKTIONEN. TEIL 2: STATISCHE UND DYNAMISCHE BERECHNUNG VON HUBSCHRAUBERROTORBLAETTERN]

N. M. Lochner *In* Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 119-123 refs In GERMAN (See N70-30551 15-34)
Avail: CFSTI

The vibration behavior of the rotor blades of the Alouette 2 helicopter was investigated. The oscillation behavior under flight conditions was considered, i.e. taking centrifugal forces into account along with the motion vertical to the plane of rotation, motion in the rotation plane, and the torsion. A fundamental frequency diagram was made and the corresponding natural oscillation forms were calculated. ESRO

N70-30572# Fraunhofer Institut, Freiburg (West Germany). Ernst-Mach-Inst.

FRACTURE MECHANICS AS A BASIS FOR THE UNDERSTANDING OF STRENGTH BEHAVIOR [DIE BRUCHMECHANIK ALS GRUNDLAGE FUER DAS VERSTAENDNIS DES FESTIGKEITSVERHALTENS]

In Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 129-135 refs In GERMAN (See N70-30551 15-34)
Avail: CFSTI

It is shown that linear elastic fracture mechanics give values easy to determine analytically and experimentally for material behavior at the initiation of unstable crack propagation. ESRO

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N70-29212# Aeronautical Research Associates of Princeton, Inc., N.J.

THE FINITE CORRELATION RANGE OF THE NONEQUILIBRIUM PAIR DISTRIBUTION FUNCTION Final Scientific Report

Guido Sandri Jan. 1970 106 p refs
(Contract AF 49(638)-1461)
(AD-701448; ARAP-140; AFOSR-70-0389TR) Avail: CFSTI CSCL 20/13

The main conceptual features of the work can be summarized as follows. The two-particle correlation function for systems which are not in thermodynamic equilibrium plays a central role in modern kinetic theory. The theoretical methods currently used to determine the correlation function essentially agree in leading order with Bogolubovs adiabatic result. Bogolubovs theory yields a function with an infinite spatial range when the particle separation is parallel to the relative velocity. The paper shows, however, that a proper asymptotic treatment yields a nonadiabatic correlation function whose range is finite (of the order of the mean free path) even with the total neglect of three-body effects. This result demonstrates that the finite spatial range is due primarily to the statistical nature of the correlation function rather than due to three-body collisions. A method of expansion is then developed that yields a satisfactory lowest-order collision integral and correlation function, opening the possibility of calculating nonequilibrium phenomena beyond lowest order. Author (TAB)

N70-29286# General Electric Co., San Jose, Calif. Atomic Power Equipment Dept.

DEFICIENT COOLING Quarterly Progress Report, 1 Jul. - 30 Sep. 1969

Oct. 1969 14 p
(Contract AT(04-3)-189)
(GEAP-13048; QPR-1) Avail: CFSTI

A 2-inch transient flow control valve was installed in the high-pressure heat transfer facility in preparation for transient flow tests. The turbine flowmeter of the loop was moved to a position downstream of the pumps for more effective metering and checking (with an orifice meter) of transient flow. A one-rod, 9-foot test section was redesigned for exploratory operations with Calrod heaters, and procurement of new materials was initiated. Analyses and procedures have been completed for conversion of recorded orifice pressure drop output data (including instrument lags) to the instantaneous flow at the orifice. Analysis of the system pressure transducer revealed that there was negligible time delay in the transducer. Recorded system pressures, from transient depressurization tests were in agreement within 1 psi of calculated instantaneous values. Author (NSA)

N70-29438# Michigan State Univ., East Lansing. Dept. of Chemistry.

VAPORIZATION THERMODYNAMICS OF EUROPIUM DIBROMIDE

John M. Haschke and Harry A. Eick [1969] 12 p refs
Sponsored by AEC and NSF
(COO-716-054) Avail: CFSTI

The congruent vaporization of condensed europium dibromide to the gaseous molecule was studied over the temperature range 1185 to 1568 K by a target collection Knudsen effusion technique. Enthalpies and free energies of formation calculated for condensed and gaseous dibromide are presented and discussed. Author (NSA)

N70-29462# Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.

HEAT TRANSFER PROBLEMS IN ADVANCED GAS TURBINES FOR NAVAL APPLICATION

Ernst R. G. Eckert 1 Jan. 1970 130 p refs
(Contract N00014-68-A-0141-0001; Proj. Themis)
(AD-701351; TR-1) Avail: CFSTI CSCL 21/5

Activities and accomplishments, up to date, are summarized which have been obtained in research on heat transfer problems in advanced gas turbines at the Heat Transfer Laboratory, School of Mechanical and Aerospace Engineering, University of Minnesota. The report discusses: Introduction; Flow and heat transfer in rotating cavities; Turbulence measurements in combustion gases; Film cooling analogy; Thermal radiation properties; Studies on turbulent shear layers; and flow through porous media. Author (TAB)

N70-29465# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

STAGNATION LIQUID LAYER ABLATION OF SMALL SPHERES IN HYPERSONIC TRANSITION FLOW Summary Report

J. L. Beal, W. R. Brown, S. R. King, S. E. Tate, and R. E. D. Stewart, comp. Albuquerque, N.Mex. Sandia Corp. May 1969 70 p refs Prepared for Sandia Corp.
(SC-CR-69-3162) Avail: CFSTI

Test materials were selected and equipment designed, fabricated, and assembled to study the melting ablation of small spheres in hypersonic transition flow over the Weber number range 1 to 10. The design concept called for the free suspension of test spheres in a vertical hypersonic stream through a balance between gravity and aerodynamic drag. However, due to lateral instability, all attempts to achieve stable suspension of the test spheres in the flow were unsuccessful. This lateral instability resulted from an undesirable radial distribution of test stream dynamic pressure. It was concluded that additional study and experimentation with nozzle design would be required in order to obtain the proper radial distribution of dynamic pressure in this low Reynolds number regime. Author (NSA)

N70-29523# Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant.

TEMPERATURE STUDY ON A HEATING COIL LOCATED IN AN EVACUATED SAND MEDIUM UNDER QUASI-ISOSTATIC PRESSURE

C. D. St. Onge 10 Feb. 1970 72 p refs
(Contract W-7405-eng-26)
(Y-1709) Avail: CFSTI

An experimental and theoretical investigation was made of heat transfer in a system developed for isostatic hot pressing using an evacuated magnesium oxide sand medium. Experimental data on transient temperature distributions were collected and matched with computer results to obtain the best-fit value for the thermal conductivity of the magnesium oxide. An optimim value of 5.3 Btu/hr.-ft.-F was statistically determined, based upon minimizing deviations between the experimental and theoretical results between 80 and 1,900 F. Author (NSA)

N70-29530# Atomics International, Canoga Park, Calif.

SODIFAZE: A STEADY-STATE MULTICHANNEL BOILING SODIUM CODE

C. J. Baroczy 15 Feb. 1970 65 p refs
(Contract AT(04-3)-701)
(AI-AEC-12804) Avail: CFSTI

Conversion of a steady-state, multichannel, boiling water code for use with Na is described. The Na version (SODIFAZE) covers the vapor quality range of 0 to 0.10, mass velocity from 0.25 × 1 million to 3 million lb/hr-sq ft, and boiling temperature from 1600 to 2000 F. Code results show that the pressure drop-flow characteristics of a three-channel geometry with fixed heat input can be significantly different from that normally observed for a single channel. A review of two-phase pressure drop and liquid fraction data for liquid metals reveals the recent data compare well with existing correlations, whereas earlier data showed substantial differences. Author (NSA)

N70-29553# National Bureau of Standards, Washington, D.C.

THE THERMODYNAMIC TEMPERATURE SCALE, ITS DEFINITION AND REALIZATION

C. M. Herzfeld *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 10 p refs Repr. from Temp. - Its Meas. and Control in Sci. and Ind., v. 3, pt. 1, 1962
Avail: SOD $4.75

A general survey of the thermodynamic temperature scale is given, and the principles and methods of its definition and realization are discussed. The concept is based on the reversible processes and equilibrium, and the scale is defined with the aid of the Carnot heat engine. The equality of the thermodynamic and ideal gas scales, and the realization of the thermodynamic scale with gas thermometers are described. Measurements are made at very low temperatures using the magnetic properties of paramagnetic solids and at very high temperatures using radiation measurements. Physical systems with negative thermodynamic temperatures are also considered. N.E.N.

N70-29554# National Bureau of Standards, Washington, D.C.

INTERNATIONAL PRACTICAL TEMPERATURE SCALE OF 1948: TEXT REVISION OF 1960

H. F. Stimson *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 10 p refs Repr. from J. Res. Natl. Bur. Std., A. Phys. and Chem., v. 65A, no. 3, May-Jun. 1961
(NBS-MONOGRAPH-3T) Avail: SOD $4.75

The scale continues to be based upon six fixed and reproducible equilibrium temperatures to which values assigned, and upon the same interpolation formulas relating temperatures to the indications of specified measuring instruments. Some changes were made in the test to make the scale more reproducible than its predecessor. The triple point of water, with the value 0.01 C replaces the former ice point as a defining fixed point of the scale. It is also recommended that the zinc point, with the value 419.505 C, be used instead of the sulfur point. Author

N70-29559# National Bureau of Standards, Washington, D.C.

THE 1958 He(4) SCALE OF TEMPERATURES. PART 1: INTRODUCTION. PART 2: TABLES FOR THE 1958 TEMPERATURE SCALE

F. G. Brickwedde, H. Van Dijk, (Leiden Univ.), M. Durieux, (Leiden Univ.), J. R. Celement, (Naval Res. Lab.), and J. K. Logan (Naval Res. Lab.) *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 19 p refs Repr. from J. Res. Natl. Bur. Std., A. Phys. and Chem., v. 64A, no. 1, Jan.-Feb. 1960
Avail: SOD $4.75

The generally used practical scale of temperatures between 1 and 5.2 K is the He-4 vapor pressure scale based on an accepted vapor pressure equation or table. This table resulted from a consideration of all reliable He-4 vapor pressure data obtained using gas thermometers, and paramagnetic susceptibility and carbon resistor thermometers. The thoeretical vapor pressure equation from statistical thermodynamics was used with thermodynamic data on liquid He-4 and the vapor equation of state to insure satisfactory agreement of the vapor pressure table with reliable thermodynamic data. Author

N70-29560# Los Alamos Scientific Lab., N.Mex.

THE 1962 HE(3) SCALE OF TEMPERATURES. PART 4: TABLES

R. H. Sherman, S. G. Sydoriak, and T. R. Roberts *In* NBS Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 10 p refs Repr. from J. Res. Natl. Bur. Std., A. Phys. and Chem. v. 68A, no. 6, Nov.-Dec. 1964 Sponsored by AEC (See N70-29552 15-14)
Avail: SOD $4.75

The vapor pressure of He-3 is tabulated in steps of 1 millidegree from 0.2 to 3.324 K, the critical temperature. A table giving temperature, to 0.1 millidegree, as a function of pressure is included, as well as the temperature derivative of the vapor pressure. Author

N70-29561# National Bureau of Standards, Washington, D.C.

CEROUS MAGNESIUM NITRATE: A MAGNETIC TEMPERATURE SCALE 0.002-2K

R. P. Hudson and R. S. Kaeser *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 20 p refs Repr. from Phys., v. 3, no. 2, 1967 p 95 - 113 (See N70-29552 15-14)
Avail: SOD $4.75

Isentropic demagnetizations from known starting conditions yielded a determination of the entropy-magnetic susceptibility, or S-chi, relation for single crystal speroids of the paramagnetic salt cerous magnesium nitrate, CMN. Enthalpy differences between the low temperature end-points thus reached and an (arbitrary) reference temperature near 1 K (determined by gamma ray heating) yielded a corresponding Q-S curve. From this S-T and chi-T relations are obtained, T being the thermodynamic temperature. The salt exhibits a broad maximum in chi centered on $S/R = 0.32$. At high temperatures ($T > 0.006$ K), all specimens show the same heat capacity. Superimposed upon this is a small anomaly first appearing at approximately 0.015 K and reaching a maximum near 0.025 K. The attribution of such an effect to small concentrations of magnetic impurities cannot be reconciled with the results of chemical analysis. Other evidence, moreover, supports the idea of a nonmagnetic origin for this anomaly. Author

N70-29576# National Bureau of Standards, Washington, D.C.

A FURNACE FOR THERMOCOUPLE CALIBRATIONS TO 2,200 C

Douglas B. Thomas *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 6 p refs Repr. from J. Res. Natl. Bur. Std., C. Eng. and Instrumentation, v. 66C, no. 3, Jul.-Sep. 1962
Avail: SOD $4.75

A tantalum-tuve furnace was constructed to calibrate and investigate the thermoelectric behavior of high temperature thermocouples. The furnace and its associated equipment were designed with emphasis on features that would assure a high degree of accuracy in measurements that are made at high temperatures and also with emphasis on trouble-free performance. Data that were obtained during furnace operation showed that thermocouple depth of immersion into a properly designed blackbody is of considerable importance if good agreement is to be realized between a calibrated optical pyrometer and a calibrated thermocouple that is placed in the hot zone of the furnace. High purity helium gas can be used in the furnace to keep thermocouple contamination to a minimum. Author

N70-29581# National Bureau of Standards, Washington, D.C.

RADIANCE TEMPERATURE AT 6550 ANGSTROM OF THE GRAPHITE ARC

R. D. Lee and E. Lewis *In its* Precision Meas. and Calibration: Selected NBS Papers on Temp. Aug. 1968 2 p refs Repr. from Appl. Optics, v. 5, Nov. 1966 p 1858 (See N70-29552 15-14)
Avail: SOD $4.75

The measurements were made with the photoelectric pyrometer, which is estimated to realize the International Practical Temperature Scale (IPTS) with a standard deviation uncertainty of 2 K at 3800 K, the approximate crater radiance temperature. The sensitivity of the pyrometer at 3800 K is 0.2 K. Spectroscopically pure graphite rods were used for thepositive and negative electrodes. The arc current (about 12.5 A) was normally kept to within 0.2 A of the overload or hissing point. From the present observations of twenty-one positive electrodes out of six different lots, the lowest observed radiance temperature was 3786 K and the highest was 3808 K. All the observed radiance temperatures fall within + or − 11 K of the nominal value of 3797 K. The low current graphite arc as presently used is significantly less reproducible than the accuracy with which the IPTS can be realized. Author

N70-29612# National Bureau of Standards, Washington, D.C. Building Research Div.

ALGORITHMS FOR PSYCHROMETRIC CALCULATIONS (SKELETON TABLES FOR THE THERMODYNAMIC PROPERTIES OF MOIST AIR)

T. Kusuda Jan. 1970 56 p refs
(PB-189459; BSS-21) Avail: SOD $0.55; CFSTI CSCL 13A

Computer algorithms to obtain thermodynamic properties of saturated and unsaturated moist air are presented. Sample calculations were performed using a computer program based upon the algorithms presented and the results are attached. Author (USGRDR)

N70-29689# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.

ON THE LINEAR THEORY OF HEAT CONDUCTION

Joseph Meixner Jan. 1970 51 p refs
(Contract N00014-67-A-0370-0001)
(AD-701326; CAM-100-10) Avail: CFSTI CSCL 20/13

A general linear theory of heat conduction is developed. General representation theorems are derived for the relations between energy, heat flow and temperature, temperature gradient. They contain aftereffect functions of a well defined class, the so-called positive definite functions. The results are given for isotropic as well as anisotropic materials. For a particular class of materials, noted as of the relaxation type, it is possible to give a non-equilibrium entropy in terms of a certain functional which satisfies a Clausius-Duhem inequality. Also a model for linear heat conduction in this class of materials is given which consists of a thermodynamic formalism with internal variables. Author (TAB)

N70-29721# Naval Radiological Defense Lab., San Francisco, Calif.

MASS FIRE SCALING WITH SMALL ELECTRICALLY HEATED MODELS Final Report

B. T. Lee May 1969 63 p refs
(Contract DAHC20-67-C-0149)
(AD-701956) Avail: CFSTI CSCL 13/12

Electrical models based on partial scaling principles neglecting molecular transport parameters have been built to scale the gross flow features of a mass fire down to laboratory size. Data in the report were obtained with two models which, when placed in a corner, simulated quadrants of a 2 foot by 2 foot and of a 4 foot by 4 foot fire. Both models consist of square arrays of electrical heating elements. Inflow air velocities at the edge of the models and updraft velocities in the hot air column above the models are measured with a hot wire anemometer. Air temperatures in the column are measured with chromel-alumel thermocouples. The heat release rates used in the models corresponded to the scaled down estimated rates at 5 and 18 minutes after ignition in the June 1966 Project Flambeau fire. Author (TAB)

N70-29914# Kansas State Univ., Manhattan. Dept. of Mechanical Engineering.

INVESTIGATION OF CONSTRAINTS IN THERMAL SIMILITUDE, VOLUME 2 Final Report, Sep. 1967 - Sep. 1969

Paul L. Miller and Francis W. Holm Dec. 1969 100 p refs
(Contract F33615-68-C-1017)
(AD-700767; AFFDL-TR-69-91-Vol-2) Avail: CFSTI CSCL 22/2

The studies described clarify the effects of some of the limitations imposed by the laws of thermal similitude, and determine the thermal modeling laws for a heat pipe. In Volume II the thermal modeling laws for a heat pipe were derived and experimentally verified. It was observed that prototype thermal behavior could be predicted, from model data, to within 10 F over the temperature range tested (140 to 330 F). Heat pipe failure due to capillary failure was also predictable to within plus or minus 10%. A flexible heat pipe was also designed and experimentally tested. Performance was not degraded under conditions of bending. Author (TAB)

N70-29943# Boeing Co., Seattle, Wash.

STEADY STATE HEAT TRANSFER ANALYSIS OF 727 B HYDRAULIC SYSTEM

A. Ade Abiodun 23 Jan. 1970 65 p refs
(AD-701407; D6-25520TN) Avail: CFSTI CSCL 13/7

The document contains the procedure for and an example of a hydraulic system heat transfer analysis. Linear equations are used to describe the heat balance in the hydraulic components, and the system of equations are solved on a digital computer. The application of this procedure is currently limited to the prediction of steady state temperatures in systems with constant mass flows. The hydraulic circuit selected for illustration is the 727 B Hydraulic System. Actual test data and results obtained in the analysis are compared. Author (TAB)

N70-29980*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

BUOYANCY EFFECTS ON LIQUID NITROGEN FILM BOILING IN VERTICAL FLOW

S. S. Papell [1970] 20 p refs Presented at Cryog. Eng. Conf., Boulder, Colo., 17-19 Jun. 1970; sponsored by NAS-NRC *Its* Tech. Paper No. G-2
(NASA-TM-X-52808) Avail: CFSTI CSCL 20M

Liquid nitrogen film boiling data were obtained for upward and downward flow through a resistance heated test section with 0.505-inch inside diameter and a 12-inch heated length. Test conditions include a pressure range from 35 to 200 psia at inlet velocities from 1.7 to 7.5 ft/sec over a range of heat fluxes from 0.007 to 0.052 Btu/sec sq in. Inlet subcooling varied from saturation at 35 psia to 45 R at 200 psia. Subject to the test conditions examined, it was found that under comparative heat fluxes and flow rates the wall temperatures for down-flow could be up to 750 R higher than for upflow. This temperature difference represents a heat-transfer coefficient for the upflow case over 8 times greater than for the downflow case. A maximum inlet velocity of about 7.5 ft/sec and a system pressure of about 100 psia were found to define the limits below which buoyancy can influence the forced convection film boiling system used in this study. The results were discussed in terms of differences in vapor film thickness and local void distribution as influenced by buoyancy, velocity, pressure, and subcooling. Author

N70-30022# Iowa State Univ. of Science and Technology, Ames.

NINTH CONFERENCE ON THERMAL CONDUCTIVITY

Howard R. Shanks, ed. Washington AEC Mar. 1970 744 p refs Conf. held at Ames, Iowa, 6-8 Oct. 1969; Sponsored by Iowa State Univ. of Sci. and Technol., AEC, and ONR
(Conf-691002) Avail: CFSTI

The activities of the conference on thermal conductivity are reported. Included are the following topics: thermal conductivities of materials at low temperatures, gases, and liquids; thermal diffusitivity of graphite; and factors affecting thermal properties in packed bed systems. Author

N70-30117# Comitato Nazionale per l'Energia Nucleare, Rome (Italy).

THEORY OF TWO-PHASE LIQUID-VAPOR FLOW, PART 3 [TEORIA DEI MOTI BIFASI LIQUIDO-VAPOR PARTE 3]

G. Basso 1969 208 p refs In ITALIAN; ENGLISH summary
(RT/ING(69)26) Avail: CFSTI

The scope of this study is to show that thermohydrodynamic instabilities, such as burn out, and the various two-phase flow patterns can be physically interpreted and analytically described on a thermodynamic basis, if the compressibility and the thermal expansion of the fluid are taken in due account. The present status of fluid mechanics have been examined with the aim of evaluating the limits of the validity, in the case of diabetic and two-phase flows. The general conditions for stability and instability of the flow are found and new theories for friction and sonic flow in pipes are developed. The analysis of unsteady flows of compressible fluids (considered as fluid-dynamic discontinuities of finite thickness) is carried out; a new theory of slip flow on microscopic basis is developed; finally, the analytic expressions of the critical sonic velocities for a single-phase fluid are found, as function of the real-flow conditions. Author

N70-30286# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Science Div.

INTENSIFICATION OF HEAT EXCHANGE IN SUPERCRITICAL DIATHERMIC HEAT EXCHANGERS

Yu. P. Yakovlev 6 Nov. 1969 14 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Energ. (Minsk), v. 10, no. 12, 1967 p 85-90
(AD-703171; FTD-MT-23-295-69) Avail: CFSTI CSCL 20/13

The possibility of work of certain heat exchangers in supercritical thermal conditions is shown. Certain materials (quartz, sital, lukaloks, and others) useful for realization of diathermic heat exchange are investigated. Super-critical diathermic heat exchangers are realizable and their effectiveness sharply increases at very high temperatures of the radiating heat-transfer agent (over 2000 degrees K). Author (TAB)

N70-30310# General Electric Co., Pleasanton, Calif. Nucleonics Lab.

A THERMODYNAMIC DATA PROGRAM INVOLVING PLUTONIA AND URANIA AT HIGH TEMPERATURES Quarterly Report, Aug. - Nov. 1969

E. A. Aitken and S. K. Evans Jan. 1970 8 p refs
(Contract AT(04-3)-189)
(GEAP-1204; QR-9) Avail: CFSTI

Progress is reported on the continuing work related to vaporization of urania, oxygen redistribution in a temperature gradient, and sodium fuel interaction. In addition, the scope of follow-on experiments to study mechanistic aspects of oxygen redistribution in a temperature is presented. Author (NSA)

N70-30333# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

AERODYNAMICS OF GAS COMBUSTION

Yu. I. Lobyntsev 17 Sep. 1969 74 p refs Transl. into ENGLISH from Gazosnabzhenie i Ispol'z. Gazav (USSR), 1968 p 37-51
(AD-701992; FTD-HT-23-241-69) Avail: CFSTI CSCL 21/2

A review is presented of Soviet papers on the aerodynamics of gas combustion, published mainly in 1956-1967, which covers aerodynamic studies of jet flame structure, studies of jet flow, aerodynamics of combustion and flame stabilization, and theoretical and experimental studies of gas burning equipment. Author (TAB)

N70-30345# Comitato Nazionale per l'Energia Nucleare, Rome (Italy).

LIQUID SUPERHEAT AND TWO-PHASE FLOW IN TRANSIENT EXPERIMENTS

G. Pinchera, G. Tomassetti, and E. Farello Oct. 1969 12 p refs Presented at the 7th Colloq. Euromech, Grenoble, France, 1968
(RT/ING(69)31; RVP-UTS(69)1 Avail: CFSTI

The paper, presented at the Colloque Euromech n. 7, held in Grenoble in 1968, contains some experimental results on liquid sodium superheating under free convection conditions, and on two-phase flow under low pressure water analogy conditions. Author

N70-30359# Argonne National Lab., Ill.

METHOD FOR RECONSTRUCTING A THERMAL-EXPANSION GRAPH FROM TWO VALUES OF THE MEAN EXPANSION COEFFICIENT

Frank L. Yaggee and Frank G. Foote Dec. 1969 13 p refs
(Contract W-31-109-eng-38)
(ANL-7644) Avail: CFSTI

A simplified method is presented for reconstructing a linear thermal-expansion graph from two known values of the mean expansion coefficient. This method assumes that the expansion curve is a monotonic function of parabolic form, and is adequately defined by a quadratic polynomial. The method provides a means of calculating values of the instantaneous expansion coefficient over any range of temperature between 0 and 1000 C, and of determining the polynomial coefficients A and B, which can be used to reconstruct the entire expansion curve. The simple computations can be done either graphically or on a desk calculator, and the results compare well within 1% of the values obtained by performing the dilatation experiment. The validity of this method is demonstrated for metals, alloys, ceramics, and cermets that have body-centered-cubic, face-centered-cubic, close-packed-hexagonal, and monoclinic crystal structures, and mean expansion coefficients with a fivefold difference in magnitude (0.000005 to 0.000023 units deg C) for the temperature range from 0 to 1000 C. Author (NSA)

N70-30394*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECTS OF GRAVITY ON LAMINAR GAS JET DIFFUSION FLAMES

Thomas H. Cochran and William J. Masica Washington Jun. 1970 26 p refs
(NASA-TN-D-5872; E-5491) Avail: CFSTI CSCL 20M

An experimental program was conducted to study the burning of laminar gas jet diffusion flames in a zero-gravity environment. The tests were conducted in the Lewis Research Center 2.2-Second Zero-Gravity Facility. The photographic results indicated that a sudden decrease in gravity level from 1 to 0 effected an immediate reduction in the length of the flame. Continued time in zero gravity resulted in the flame expanding away from the burner until extinguishment appeared to occur. Nondimensionalization of the governing flow equation yielded the parameters used to correlate the buoyancy effects. Author

N70-30526 National Lending Library for Science and Technology, Boston Spa (England).

DESIGN CALCULATIONS FOR TUBULAR HEAT-EXCHANGE UNITS WITH A LONGITUDINAL FLOW IN THE SPACE BETWEEN THE TUBES [K RASCHETU TRUBCHATYKH TEPLOOBMENNYKH APPARATOV S PRODOLNYM OMYVANIEM MEZHTRUBNOGO PROSTRANSTVA]

E. K. Kalinin et al Feb. 1970 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Aviats. Tekh. (Kazan), no. 1, 1968 p 146-148
(NLL-RTS-5512) Avail: Natl. Lending Library, Boston Spa, Engl.: 7s 6d or 1 NLL photocopy coupon

Heat transfer and fluid friction in square-lattice tube bundles with longitudunal flow in the space between the tubes are calculated by using the mean temperature of the boundary layer, and the mean temperature of the coolant. The calculations for five relative spacings for closed-cycle gas-turbine installations with three-working gases, helium, nitrogen, and carbon dioxide are tabulated. F.O.S.

N70-30541# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ACADEMY OF SCIENCES OF THE USSR NEWS. POWER ENGINEERING AND TRANSPORTATION: SELECTED ARTICLES

M. I. Braynin et al 18 Nov. 1968 37 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Izv. Energ. i Transp. (USSR), no. 3, 1967 p 115-136
(AD-683532; FTD-HT-23-221-68) Avail: CFSTI CSCL 20/13

Contents: The hydrodynamics of the laminar flow of a thin liquid film across an inclined cylinder; and The application of a new method for the calculation of local characteristics of radiation to the numerical solution of some concrete problems of radiant heat transfer. TAB

34 GENERAL

Includes reports of a broad nature related to industrial applications and technology, and to basic research; defense aspects; law and related legal matters; and legislative hearings and documents.

N70-29240# Oak Ridge National Lab., Tenn.

COLLABORATION BETWEEN INFORMATION ANALYSIS CENTERS AT A LARGE, MULTIPURPOSE LABORATORY

Francois Kertesz [1969] 16 p refs Sponsored by AEC
(TID-25347; SM-128/29) Avail: CFSTI

The interaction and collaboration of a group of information centers located at the same large multipurpose institution are discussed, and the information centers at Oak Ridge National Laboratory are described as an example. NSA

N70-29318# Joint Publications Research Service, Washington, D.C.

SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 225

26 Mar. 1970 54 p refs Transl. into ENGLISH from various Russian publications
(JPRS-50162) Avail: CFSTI

CONTENTS:

1. ASTRONOMY p 1-7 refs (See N70-29319 15-30)
2. METEOROLOGY p 8-19 refs (See N70-29320 15-20)
3. OCEANOGRAPHY p 20-21 refs (See N70-29321 15-13)
4. TERRESTRIAL GEOPHYSICS p 22-35 refs (See N70-29322 15-13)
5. UPPER ATMOSPHERE AND SPACE RESEARCH p 36-55 refs (See N70-29323 15-13)
6. MISCELLANEOUS p 56-57 refs

N70-29327# Joint Publications Research Service, Washington, D.C.

SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 223

27 Feb. 1970 57 p refs Transl. into ENGLISH from various Russian publications
(JPRS-49937) Avail: CFSTI

CONTENTS:
1. ASTRONOMY p 1-6 refs (See N70-29328 15-30)
2. METEOROLOGY p 7-21 refs (See N70-29329 15-20)
3. OCEANOGRAPHY p 22-29 refs (See N70-29330 15-13)
4. TERRESTRIAL GEOPHYSICS p 30-43 refs (See N70-29331 15-13)
5. UPPER ATMOSPHERE AND SPACE RESEARCH p 44-49 refs (See N70-29332 15-13)
6. MISCALLENEOUS p 50-51 refs

N70-29336# Joint Publications Research Service, Washington, D.C.

SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 222

16 Feb. 1970 97 p refs Transl. into ENGLISH from various Russian publications
(JPRS-49849) Avail: CFSTI

CONTENTS:
1. ASTRONOMY p 1-10 refs (See N70-29337 15-30)
2. METEOROLOGY p 11-28 refs (See N70-29338 15-20)
3. OCEANOGRAPHY p 29-52 refs (See N70-29339 15-13)
4. TERRESTRIAL GEOPHYSICS p 53-68 refs (See N70-29340 15-13)
5. UPPER ATMOSPHERE AND SPACE RESEARCH p 69-85 refs (See N70-29341 15-13)
6. MISCELLANEOUS p 86-87 refs

N70-29432# Joint Publications Research Service, Washington, D.C.

SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 224

11 Mar. 1970 63 p refs Transl. into ENGLISH from various Russian publications
(JPRS-50052) Avail: CFSTI

CONTENTS:
1. ASTRONOMY p 1-7 refs (See N70-29433 15-30)
2. METEOROLOGY p 8-18 refs (See N70-29434 15-20)
3. OCEANOGRAPHY p 19-26 refs (See N70-29435 15-13)
4. TERRESTRIAL GEOPHYSICS p 27-41 refs (See N70-29436 15-13)
5. UPPER ATMOSPHERE AND SPACE RESEARCH p 42-55 refs (See N70-29437 15-13)
6. MISCELLANEOUS p 56-58 refs

N70-29774# Air Force Weapons Lab., Kirtland AFB, N.Mex.

PROCEEDINGS OF THE FIFTH ANNUAL SYMPOSIUM: SCIENCE, PHILOSOPHY, RELIGION

15 Nov. 1968 99 p Held at Albuquerque, N.Mex., 13-15 Nov. 1968
(AD-685210) Avail: CFSTI CSCL 5/11

Five papers are given relating to the theme: Weapons technology--conscience. TAB

N70-29799*# Translation Consultants, Ltd., Arlington, Va.

NATIONAL CENTER FOR TECHNICAL AND SCIENTIFIC DOCUMENTATION ACTIVITY REPORT, 1969 [RAPPORT D'ACTIVITE 1969, CENTRE NATIONAL DE DOCUMENTATION SCIENTIFIQUE ET TECHNIQUE]

Washington NASA Jun. 1970 21 p Transl. into ENGLISH from Belgian rept., 1970 p 1-21
(Contract NASw-2038)
(NASA-TT-F-13110) Avail: CFSTI CSCL 05B

Major activities and accomplishments of 1969 and setting up the management program for 1970 are discussed. Included is a list of the scientific publications of the center. Subsequent sections contain a list of the publications for 1969 and a personnel register. Author

N70-29944# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SCIENTIFIC AND TECHNICAL INFORMATION. SERIES 2: INFORMATION PROCESSES AND SYSTEMS

E. F. Skorokhodko et al 23 Aug. 1968 43 p refs Transl. into ENGLISH from Nauchn.-Tekhn. Inform., Ser. 2: Inform. Protessy Sistemy (USSR), no. 1, 1967 p 30-40
(AD-683147; FTD-HT-23-275-68) Avail: CFSTI CSCL 5/2

Contents: Some causes of losses and noise during documentational information retrieval; An experimental system for automatic translation of publications from the American Patent Weekly Official Gazette. TAB

N70-29979*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

MANAGEMENT: A SELECTIVE BIBLIOGRAPHY

28 May 1970 185 p refs
(NASA-TM-X-62945; GP-532-Suppl) Avail: CFSTI CSCL 05A

This supplement follows the format of the original bibliography. The six hundred and forty six items listed are arranged alphabetically by title. Entries have been annotated only when the book was available for examination. The author and subject index will facilitate finding the materials included. A list of periodicals and newspapers wholly or partially devoted to management is included. Author

N70-30289# Federal Aviation Administration, Washington, D.C. Airports Service.

FAA'S 1969 GENERAL AVIATION PUBLIC AIRPORT FINANCIAL SURVEY

Sep. 1969 33 p
(AD-701760) Avail: CFSTI CSCL 5/5

The report presents an analysis of the results of the 1969 General Aviation Public Airport Financial Survey. The survey was conducted by the System Planning Division, Airports Service, with supporting services provided by the Office of Management Systems. The purpose of the survey was to obtain current airport revenue and expense data to better understand the financial operations of the Nations general aviation airports and to serve as a basis for recommending Federal assistance programs related to airport development. The canvas was made for the Calendar Year 1968, the latest year of record. Author (TAB)

N70-30367# Joint Publications Research Service, Washington, D.C.

DRAFT: USSR STATE STANDARD UNITS OF PHYSICAL VARIABLES

1 Jun. 1970 44 p refs Transl. into ENGLISH from Izmerit. Tekhn. (Moscow), no. 2, 1970 p 4-27
(JPRS-50620) Avail: CFSTI

The standard which establishes the units of physical variables approved for application in the Soviet Union, their names, notation and definitions, and also rules of application are considered. Author

N70-30455# Joint Publications Research Service, Washington, D.C.

TRANSLATIONS ON EASTERN EUROPE SCIENTIFIC AFFAIRS, NO. 117

3 Jun. 1970 81 p refs Transl. into ENGLISH from various eastern European publications
(JPRS-50643) Avail: CFSTI

Scientific research in Bulgaria, Romania, and Yugoslavia is reported. Work is included on physics, mathematics, electronics, geophysics, astronomy, meteorology, and drugs. J.A.M.

N70-30531*# Stanford Research Inst., Menlo Park, Calif.

ACTIVITIES OF THE NASA SPONSORED SRI TECHNOLOGY APPLICATIONS TEAM IN TRANSFER OF AEROSPACE TECHNOLOGY TO THE PUBLIC SECTOR Quarterly Progress Report, 1 Oct. – 31 Dec. 1969

31 Dec. 1969 65 p refs
(Contract NASw-1992)
(NASA-CR-110238; QPR-2) Avail: CFSTI CSCL 05B

Problems statements on air pollution, transportation, and criminalistics are presented. The objective is to apply the resources of an interdisciplinary technology applications team to plan, coordinate, control, and evaluate a program for optimizing the match between public sector problems and potential solutions by computer-searching the NASA data banks. Emphasis is on public agencies west of the Rockies. Author

N70-30551# Fraunhofer-Gesellschaft zur Forderung der Angewandten Forschung E. V., Munich (West Germany).

EXAMPLES OF APPLIED RESEARCH Annual Report 1968/1969 **[BEISPIELE ANGEWANDTER FORSCHUNG JAHRBUCH 1968/1969]**

Jun. 1969 149 p refs In GERMAN
Avail: CFSTI

This yearbook of the Fraunhofer Society surveys the activities of its institutes in 1968/1969. The reports concern phenomenology and investigation methods; physics, chemistry and physical chemistry; meteorology and climatology; digital techniques, communications engineering and electronics; mechanical engineering and manufacturing techniques; measuring methods, materials handling and industrial processing. For individual titles, see N70-30552 through N70-30575. Author

N70-30560# Fraunhofer-Gesellschaft, Stuttgart (West Germany). Inst. fuer Technische Physik.

PROBLEMS OF ROOM HEATING IN SUMMER [ZUR PROBLEMATIK DER SOMMERLICHEN RAUMERWAERMUNG]

K. Gertis *In its* Examples of Appl. Res. Jun. 1969 p 60 – 63 In GERMAN (See N70-30551 15-34)
Avail: CFSTI

Modern buildings have large window glass surfaces and in summertime, depending on glass type and wall material, room temperatures can become intolerable. To solve this problem, architects should choose suitable building materials for inner rooms rather than use expensive air-conditioning systems. ESRO

N70-30567# Technische Hochschule, Karlsruhe (West Germany). Inst. fuer Angewandte Physik und Technische Entwicklungen.

PROGRESS IN FREEZING METHODS FOR FOUNDATION, SHAFT AND TUNNEL CONSTRUCTION [FORTSCHRITTE DES GEFRIERVERFAHRENS IM GRUND-, SCHACHT- UND TUNNELBAU]

W. Staender *In* Fraunhofer-Ges. Examples of Appl. Res. Jun. 1969 p 99 – 106 In GERMAN (See N70-30551 15-34)
Avail: CFSTI

Freezing methods are used in construction work to stabilize loose soil and to seal it against ground water. Freezing tubes, driven perpendicularly into the ground, are normally used and current practices are surveyed in this paper. ESRO

N70-30568# Fraunhofer-Gesellschaft zur Forderung der Angewandten Forschung E. V., Lindau (West Germany). Technische Forschungs- und Entwicklungsstelle.

DEVELOPMENT OF A MOTORBOAT FOR HIGH SEAS AND WINTER [GEDANKEN ZUR ENTWICKLUNG EINES AUTOBOOTES FUER HOCHSEE UND WINTER]

F. Wankel *In its* Examples of Appl. Res. Jun. 1969 p 107 – 112 In GERMAN (See N70-30551 15-34)
Avail: CFSTI

Boat, aircraft, and automobile building are compared and it is concluded that the design of small seaworthy boats is far behind analogous developments on land and in the air. Some suggestions are given for improved boat designs. ESRO

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Lines, patterns, and colors in aerial and space photos reveal what both nature and man have done to the face of the earth. Land uses traceable to cultural and societal developments usually contrast sharply with phenomena resulting from the natural or physical base. Restricted by his environment, man has been forced either to adapt himself to the land or to modify it with machinery and structures. In photos taken from high altitudes, highways appear as networks of fine lines, agricultural fields produce recognizable patterns, and the areas from which forests have been cleared stand out brightly. Colors are indicative of the vegetation, soil conditions, the depth of water, and many other matters of vital concern to mankind. *Paperbound.* 80 pp. Price $1.75. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

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